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The Bureau assumes no responsibility with regard to the opinions and the results of work outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART

THE INTERNATIONAL TRADE IN FEEDING STUFFS.

2^d Review, No. 2

April 1, 1916

Introduction (p. 167). — World's Production of Feeding Stuffs (p. 175). —
Foreign Trade of Various Countries in Feeding Stuffs (p. 187). — Prices of Feeding Stuffs
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INTRODUCTION.

In accordance with a resolution of the last General Assembly of the International Institute of Agriculture (1), we now publish the second (2^d) Review of the International Trade in Feeding Stuffs.

The preceding Review, published April 1, 1915, Vol. VI, No. 4 of this *Annuaire* contained a list of the available statistical data, for various countries, relating to concentrated feeding stuffs for live-stock. The object of this (2^d) Review, as explained in the Introduction, was to serve as a basis for the elaboration of an international statistical survey of these products.

Following the plan approved by the Permanent Committee of the Institute at the meeting on December 13, 1915, this Review now appears in form of systematic statistical tables, and constitutes a first attempt to fill a gap existing in our international agricultural statistics. These tables will contain statistical data relating to all such products for which exact figures are forthcoming. Data concerning other products will be added as soon as their international movement acquires sufficient importance.

The products treated in this Review may be divided into the following categories :

- a) *Residues of Milling Industry ;*
- b) *Oil*
- c) *Sugar*
- d) *Breeding and allied Industries.*
- e) *Animal Origin.*

For information concerning cereals and other direct agricultural produce, the reader is referred to the general statistics published in the *Annuaire international de Statistique agricole* and in the *Bulletin of Agricultural and Commercial Statistics*. At the same time, information is given where possible as to the relative quantity of these products utilised as concentrated foods for live stock. Further, a special table is devoted to the foreign trade of those countries for which sufficient statistical data are in existence.

The five categories mentioned above are dealt with under the following headings.

Production. The production of wheat and rye bran is taken as a basis. This is calculated on the basis of the quantities of cereals available for consumption by means of a coefficient giving results closely approximating to the actual facts. Next comes the production of rice residues, husks and bran, this also being calculated on the basis of gross quantities available by means of a further coefficient.

Following the above will be found data relating to residues from the extraction of oil seeds and fruits. In this case an attempt has been made for the first time, to establish the movement of the raw materials—importation from the countries of origin and amounts available in the countries importing them ; in this way the necessary elements are obtained for calculating, again by means of a coefficient, the production of cake in a particular country.

Another method, however, has been adopted for linseed cakes, in the case of which it has been possible to make a direct determination of the quantities available in the producing and exporting countries ; similarly for cotton seed cakes, in the case of which the chief producing country—the United States—has established special statistics ; and for rape cakes, where it has also been possible to calculate the production on the direct basis of the quantity of seed available.

The future development of this branch of our statistical work will, it is hoped, to compile eventually statistics dealing with the production of cake for two other important centres : India and Egypt.

The availability data which serve as the basis of our calculations when not already given among the elements of the present Review, are taken from the *Annuaire international de Statistique agricole*, 1913 and 1914 or from the Monthly Bulletins of Agricultural and Commercial Statistics for the years 1915 and 1919, published by the Bureau of Statistics of the Institute.

Foreign Trade of the Various Countries.—Export and import figures

given in a series of ten tables for all those products which actually are said to be capable of serving as concentrated foods for live-

stock. We have classed together all those which, owing to similarity of origin or markets, are capable of homogeneous treatment.

The first item under this heading is a table giving the amount of food available in a number of cereal and pulse grains and roots, for which quantities available for live-stock consumption are known.

Prices. — On account of the comparative disorganisation of the international market, we have been obliged, for the present, to restrict ourselves to giving the prices of the chief concentrates only in those markets which remained open for international trade.

These prices will present a view of comparative price levels of such commodities.

In conclusion, it should be remarked that, wherever possible, the figures relating to production and trade have been given for the last five years including 1915. The exceptions are formed by a certain number of recent countries and colonies, in the case of which the publication of figures has been delayed. The prices, on the other hand, are those of the year only and have been calculated on the basis of London exchange. In the present state of affairs it has been impossible to give those for the preceding years.

Bibliography. A list of 280 references will provide the reader with information as to the progress made in the production and employment of concentrated and other similar foods for live-stock during the past years. They are taken from periodicals and other publications received by the International Institute of Agriculture during the period March 31, 1916, to March 31, 1919.

PRODUCTION OF CONCENTRATED FOODS FOR LIVESTOCK

Coefficients

As stated in the *Introduction*, the production of concentrates considered in the present Review has been calculated on the basis of the quantities of raw materials available for consumption by the aid of coefficients corresponding to conditions actually obtaining in the different countries.

$$\text{WHEAT MEAL} = (a + b + d) \times \frac{25}{100}$$

$$\text{PALE MALT} = (a + b + c) \times \frac{32}{100}$$

$$c = \text{Production} - b - \text{quantity sown} - i - \text{Imports} - e - \text{Exports}$$

RICE PRODUCTS

Production of husks

$$\text{Husks} = (a + c + d) \times \frac{20}{100}$$

$$\text{Bran} = (a + c + d) \times \frac{10}{100}$$

$$a = \text{Production} - b - \text{quantity sown} - i - \text{Imports of rice in husk} - e - \text{Exports of rice in husk}$$

Quantity of rice in husk

$$\text{Husk} = (c + d) \times \frac{20}{100}$$

$$\text{Bran} = (c + d) \times \frac{10}{100}$$

$$a = \text{Imports of rice in husk} - d - \text{Exports of rice in husk}$$

$$\text{LINSSEED CAKES} = (a + c + b + d) \times \frac{50}{100}$$

$$c = \text{Production} - b - \text{quantity sown} - i - \text{Imports} - e - \text{Exports}$$

COTTON CAKES—Except in the case of the United States, for which the coefficient of 15 per cent of the yield has been employed for calculating the output of cake, the coefficient figures in the different countries is 10 per cent. This variation is explained by different conditions of extraction.

$$\text{RAPE CAKES} = (a + c + b + d) \times \frac{50}{100}$$

$$c = \text{Production} - b - \text{quantity sown} - i - \text{Imports} - e - \text{Exports}$$

OTHER KINDS OF OIL CAKES—The production has been calculated on the basis of the quantity available of the raw material.

RESIDUES OF BEET SUGAR INDUSTRY.

$$\text{Beet slices (calculated on quantity of dry matter)} = \text{Production} \times \frac{5}{100}$$

$$\text{Molasses} = \text{Production} \times \frac{2}{100}$$

Residues of Milling Industry.

PRODUCTION OF WHEAT BRAN

(Statistics of quantities of wheat available for consumption within the various countries)

Countries	1913	1914	1915	1916	1917
metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Algeria	1475.975	1501.325	1583.100	1555.000	1555.000
Argentina	207.450	318.325	147.000	409.025	351.020
Australia	1543.875	1544.875	1358.125	1555.000	1555.000
Belgium	505.575	409.725	419.025	419.025	419.025
Bulgaria	193.325	181.500	213.525	144.750	155.000
Canada	100.075	119.270	128.328	103.375	119.270
China	51.075	68.050	10.425	53.079	67.073
Czechoslovakia	231.000	184.500	237.575	208.000	230.321
Denmark	912.000	623.000	610.000	177.042	155.000
France	3522.125	4004.000	1010.000	4244.175	4182.103
Germany	8184.050	2209.825	2318.225	2149.011	1843.222
Greece	181.907	113.015	186.068	155.000	177.201
India	25.527	13.001	37.011	14.250	59.475
Italy	1649.325	1752.400	1701.975	1720.048	1602.322
Japan	215.570	219.551	27.550	204.400	68.205
Latvia	951.000	577.775	582.125	509.103	130.476
Lithuania	1820.881	1661.591	1705.119	1602.236	2038.415
Poland	45.025	47.819	32.226	33.725	35.000
Romania	1508.125	1420.625	1754.775	1561.729	1456.832
Russia	175.117	182.350	209.790	162.149	155.000
Siam	6.025	6.000	1.175	13.971	15.000
Sweden	119.050	152.050	139.050	128.118	186.230
Switzerland	74.075	74.075	74.075	74.075	74.075
Turkey	109.075	107.500	200.875	129.223	517.522
United Kingdom and Ireland	1974.125	3812.025	5250.500	3599.977	3599.977
U.S.A.	93.000	80.800	101.475	101.475	101.475
Yugoslavia	131.600	138.500	151.225	131.271	131.271

In estimating the production of wheat bran in Germany, no allowance has been made for 3 per cent of the quantity of wheat available (the quantity normally used as a concentrated food for live stock), as this percentage is included within the limits of our calculation. (Cf. WAAGE, *Die Entwicklung der Futtermittelhandels in den letzten Jahren. Das Saatgut, Düngemittel und Futtermittelmarkt*, Jubiläumsausgabe, December 3 and 8, 1914.) For Italy, we have taken into consideration (for 1915) the new regulations with regard to milling, imposing an 80 % flour with a limit of 20 % of offals.

With regard to the production of rye in Germany we have subtracted 10 % of the quantity available as this is the normal percentage of rye used as a concentrated food for live-stock (*Ibid.*).

PRODUCTION OF RYE BRAN

Calculated on basis of quantities of rye available for consumption.

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	2,700,342	2,894,717	3,045,710	3,122,000	3,200,000
Austria-Hungary	1,112,685	1,262,272	1,136,090	1,222,000	1,250,000
Belgium	233,600	195,008	219,960	222,000	222,000
Bulgaria	35,781	38,146	47,724	.....	.....
Chile	224	1,056	1,088	800	.....
Denmark	186,320	179,712	197,012	120,074	112,000
Spain	291,640	122,132	197,594	157,490	150,000
United States	249,192	256,128	296,190	235,377	227,000
France	358,912	368,032	373,472	397,118	407,000
Australia	992	419	704	.....	.....
Canada	19,320	18,770	16,992	13,294	12,000
Italy	38,580	39,774	43,260	38,111	42,000
Norway	13,357	61,820	68,189	51,280	50,000
Netherlands	211,004	198,400	208,096	161,792	147,000
Roumania	.....	4,672	60,806	1,820	.....
Russia in Europe and R. in Asia	4,600,008	7,072,480	6,789,000	5,335,144	5,000,000
Sweden	183,135	198,074	187,008	.....	.....
Switzerland	19,776	18,652	18,430	15,000	15,000

Residues of Oil Industry.

PRODUCTION OF LINSEED CAKES

(calculated on quantities of seed available).

Country	1911	1912	1913	1914
metric tons metric tons metric tons metric tons				
<i>a) Production in tons</i>				
Austria-Hungary	21 594	27 594	36 679	.....
Belgium	14 200	11 745	36 765	.....
Bulgaria	193	77	.....	.....
Chile	29	316	213	.....
United States	257 398	599 297	237 194	234 517
France	58 748	78 600	119 852	63 600
Algeria	27	.....	.....	.....
Canada	91 325	166 613	.....	.....
British India	.....	.....	.....	.....
Italy	23 783	24 410	27 170	18 941
Japan	747	.....	.....	.....
Netho-Lands	70 121	78 495	102 851	98 211
Romania	4 215	5 818	.....	17 000
Russia in Europe	77 115	94 262	145 599	.....
Sweden	10 135	.....	14 115	.....
<i>b) Imports in tons</i>				
Germany	135 000	102 150	278 100	.....
Denmark	4 150	3 800	9 000	11 800
United Kingdom	131 500	134 600	308 000	231 300
Australia	750	1 100	1 718	2 280
Norway	4 000	5 000	7 350	5 600

Cottonseed.

PRODUCTION OF COTTONSEED CAKES AND MEAL
IN THE UNITED STATES (based on the crop yield).

Products	1911	1912	1913	1914	1915 (5 months)
	metric tons	metric tons	metric tons	metric tons	metric tons
1. Cottonseed.....	6,347,573	5,533,457	5,194,804	6,803,883	.....
2. Cottonseed:					
(a) Crushed:					
Cakes.....	314,060	388,081	155,146	149,306	.....
Meal.....	220,210	210,730	283,136	90,851	.....
(b) Middling.....	281,046	288,114	351,715	107,618	.....
(c) Oil.....	309,281	220,513	312,011	73,044	.....
(d) Other.....	11,299	21,455	30,074	11,800	.....
(e) Total.....	572,285	781,247	959,197	327,494	.....
3. Cottonseed cake and meal.....	137,058	130,276	150,509	63,506	.....
4. Cottonseed cake and meal:					
(a) Crushed.....	35,100	455,793	418,097	102,177	.....
(b) Middling.....	29,338	25,206	29,235	8,551	.....
(c) Oil.....	308,946	373,118	447,192	145,312	.....
(d) Other.....	10,446	23,505	25,134	82,151	.....
(e) Total.....	1,425,157	1,058,112	1,873,939	558,379	.....
5. United States.....	37,433	55,199	79,978	19,053	.....
6. Foreign.....	4,164,324	4,154,161	4,321,279	5,243,220	(797,260)
7. % of cakes and meal.....	1,051.35%	1,813.46%	(1,866.01%)	(2,206.53%)	(478.200%)

EXPORTS OF COTTONSEED BY PRODUCING COUNTRIES.

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
1. United States.....	13,479	18,598	11,032	14,862	(1)
2. Foreign.....	403,297	472,392	373,793	316,060	367,742
3. United States (year ending March 31).....	5,098	20,057	10,908	7,414	2,804
4. Foreign (year ending March 31).....	193,193	144,239	218,707	129,526	67,072
5. United States (year ending March 31).....	1,639	20,74	5,794	(1)	(1)
6. Foreign (year ending March 31).....	191,733	147,294	222,911	.....	.....
7. United States.....	677,417	667,161	619,654	(667,891)	(437,678)

(1) Figures not available.

COTTONSEED TRADE OF IMPORTING COUNTRIES.

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
Germany:—				
imports.....	155,785	214,097	219,797 (a)	120,907
exports.....	2,317	1,802	869 (a)	2,100
	153,468	212,295	218,928	120,717
Austria-Hungary:—				
import.....	5,802	11,233	3,813 (a)	2,000
exports.....		1,408	1255	
	5,802	9,825	2,558	2,000
France:—				
imports.....	30,555	31,935	17,679	14,712
exports.....	267	141	925	708
	30,288	31,794	16,754	14,004
United Kingdom:—				
imports.....	60,470	63,905	62,932	75,122
Japan:—				
imports.....	11,894		12,039	14,375 (a)

(a) Figures not available. (b) First half year. (c) 11 months.

PRODUCTION OF COTTONSEED CAKES IN IMPORTING COUNTRIES.

calculated on quantities of seed available.

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
Germany.....	76,724	106,147	109,494	60,351
Austria-Hungary.....	2,601	4,867	1,279	1,018
France.....	15,144	17,397	8,372	7,017
United Kingdom.....	39,235	31,697	31,466	38,661
Japan.....	5,947		6,019	7,186 (a)

PRODUCTION OF RAPE CAKES

(calculated on quantities of seed available).

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
Belgium	7 142	59 293	74 227	33 182	.....
Hungary	147 378	19 001	22 000	4 210	.....
Italy	22 001	17 045	18 595	11 825	.....
Spain	1 585	44 906	24 211	13 153	.....
Sweden	60 455	1 502	1 072	19	4 035
German and Ireland	21 721	17 429	25 055	29 170	18 146
India	480 140	547 269	504 495	426 805	.....
Japan	3 351	1 004	5 001	10 988	2 254
U.S.A.	65 668	74 490	134 508	12 754	26 133
China	203	128	482	255	226
France	17 778	15 357	15 877	10 091	7 787
Other	580	723	457	94	.....

Ground-Nuts.

In the case of ground-nuts, figures are given both for whole pods and for hulled seeds. As, however, the yield in cake must be based upon the figures of the latter, we have converted the figures for the whole pods to their equivalents in hulled seed by allowing a normal yield of 75 per cent.

In addition to the data for ground-nuts, systematic statistics are given for the first time relating to other oil seeds and fruits in the chief producing countries. These products are daily growing in importance, not only in economy of various colonies but also in their capacity as the basal material of such important concentrates in modern feeding practice as the copra and palm-kernel cake. It is intended, later on, to treat of other similar products which are not yet of sufficient general importance such as mowrah, perilla etc.

EXPORTATION OF GROUND-NUTS BY PRODUCING COUNTRIES

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
German colonies:				
Former German E. Africa	2 506	6 079	(1)	(1)
China:				
in hulls	64 920	51 793	63 741	22 457
equivalent in hulled seeds	48 690	38 815	47 806	16 771
hulled seeds			5 293	6 812
	48 690	38 815	(53 099)	(23 583)
Egypt*	877	794	557	206
French colonies:				
Senegal:				
in hulls	164 968	184 762	(1)	(1)
equivalent in hulled seeds	123 681	139 571		
Upper Senegal and Niger:				
in hulls	5 111	1 761	(1)	(1)
equivalent in hulled seeds	3 833	1 321		
hulled seeds		5 830	(1)	(1)
French Guinea:				
in hulls	1 056	2 020	(1)	(1)
equivalent in hulled seeds	792	1 515		
Mayotte and dependencies:				
in hulls	34	34	(1)	(1)
equivalent in hulled seeds	25	25		
Indo China:				
hulled seeds	202	495	(1)	(1)
French possessions in India:				
in hulls	10	9		
equivalent in hulled seeds	7	7		
hulled seeds	76	213		
	128 616	134 057		
British colonies:				
India	204 249	221 679	259 158	266 030
Gambia	48 790	65 199	68 486	
Nigeria:				
in hulls	890	1 743	(1)	(1)
equivalent in hulled seeds	667	1 307		
hulled seeds	1 198	2 559	(1)	(1)
	254 805	290 744	(327 644)	(266 030)
Japan	4 679	3 919	5 928	5 500
Dutch colonies:				
East Indies:				
in hulls		3 266	13 793	9 974
equivalent in hulled seeds	(1)	2 449	10 345	7 489
hulled seeds	(1)	9 940	6 268	7 055
Portuguese colonies:		12 389	16 613	15 138
Portuguese S. E. Africa	(1)	5 113	(1)	(1)
	(440 173)	(491 940)	(403 811)	(310 094)

* Exported for direct consumption. — (1) Figures not available. — (2) 11 months

GROUND-NUT TRADE OF IMPORTING COUNTRIES.

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
France	44 534	60 860	68 085 (2)	83 040	(1)
Germany	2 074	1 188	3 000 (2)	2 418	(1)
Spain: (years ending 1911)					
.....	7 844	5 865	5 571	7 025	6 506
present in hulled seeds..	5 883	4 300	4 178	5 941	4 917
in seeds.....	1 962	1 565	1 393	1 084	1 589
.....	5 883	5 501	7 203	18 220	9 321
Italy	216 770	222 380	255 713	270 194	255 713
present in hulled seeds..	162 577	166 785	161 785	202 645	191 785
in seeds.....	178 379	245 230	247 754	260 814	237 754
.....	349 056	412 021	429 539	472 159	429 539
Belgium	15 137	13 644	16 999	12 634	8 015
present in hulled seeds..	11 353	10 233	12 749	9 475	6 011
in seeds.....	4 358	5 065	2 192	1 099	3 015
.....	15 711	15 868	14 941	11 384	9 626
.....	325 245	390 123	414 508	401 075	430 013
Canada	47 582	52 170	67 428	64 107	47 416
.....	12 762	12 704	19 610	21 700	6 548
.....	34 820	39 483	47 812	42 407	40 868

(1) not available, — (2) 1st half-year.

PRODUCTION OF GROUND-NUT CAKES IN IMPORTING COUNTRIES.

(calculated on quantities available for consumption).

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
France	22 267	34 934	49 042	41 970	.....
Belgium	1 037	594	1 833	1 209	.....
United States	2 941	2 795	3 631	9 113	4 660
Germany	162 622	198 661	207 299	239 537	200 956
Belgium	17 410	19 692	23 906	21 233	20 434

Sesame.

EXPORTATION OF SESAME BY PRODUCING COUNTRIES

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
German colonies:				
Former German E. Africa.....	1 514	1 881	(1)	(1)
China.....	125 324	120 892	123 601	75 038
Ottoman Empire *.....	18 492	12 192	(1)	(1)
French colonies:				
Upper Senegal and Niger.....	12	7	(1)	(1)
French Guinea.....	564	411	(1)	(1)
Indo China.....	1 030	804	(1)	(1)
	1 606	1 312	(1)	(1)
British possessions:				
India.....	136 313	62 360	104 069	100 040
Sudan.....	4 935	6 094	6 839	(1)
British E. Africa (year ending March 31).....	2 060	3 494	4 088	3 871
Uganda (year ending March 31).....	538	709	1 596	910
Nigeria.....	469	448	1 055	(1)
Sierra Leone.....	112	46	36	(1)
	144 427	73 151	117 683	105 721
Portuguese colonies:				
Portuguese E. Africa.....	(1)	1 330	(1)	(1)
	(1)	1 330	(1)	(1)
Dutch colonies:				
Dutch E. Indies.....	(1)	1 302	1 987	2 445
	(146 033)	77 095	(118 670)	(108 100)

* The figure for 1911 refers to the year ending March 13; that for 1912 to the exportation from the ports of Haifa, Gaffa, Mersina, Adalia, Ayas and Smyrna. — (1) Figures not available.

SESAME TRADE OF PRODUCING COUNTRIES.

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
<i>India</i>					
Exports	101 672	99 282	110 630 (2)	88 237	(1)
<i>Uganda-Hungary</i>					
Exports	42 200	31 414	26 620 (2)	17 186	(1)
Imports	24	4	455 (2)	1	(1)
	42 176	31 410	26 174	17 188	—
<i>Yokohama</i>					
Exports	6 307	2 544	4 018 (2)	4 300	(1)
<i>Yokohama</i>					
Exports	98 373	10 011	20 586	21 675	15 874
Imports	2 669	1 114	925	708	1 055
	95 704	18 107	19 661	20 967	15 919
<i>Yokohama</i>					
Exports	40 870	25 358	24 774	28 803 (3)	32 645
Imports	19	27	16	20	12
	40 857	25 331	24 758	28 837	32 633
<i>Yokohama</i>					
Exports	4 774	5 070	5 055	6 744 (4)	9 717
Imports	3 878	3 900			

* Same and Ground-units. — (1) Figures not available. — (2) 1st half year. — (3) 10 months. — (4) 10 months.

PRODUCTION OF SESAME CAKE IN IMPORTING COUNTRIES.
(calculated on quantities available for consumption).

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
<i>India</i>					
Exports	50 836	43 611	58 019	44 118	
<i>Uganda-Hungary</i>					
Exports	21 088	15 705	13 087	8 594	
<i>Yokohama</i>					
Exports	3 108	1 272	2 007	2 198	
<i>Yokohama</i>					
Exports	47 852	9 098	9 830	10 483	6 959
<i>Yokohama</i>					
Exports	20 428	12 665	12 379	14 418	16 316
<i>Yokohama</i>					
Exports	2 387	2 985	2 977	3 372	4 858
<i>Yokohama</i>					
Exports	1 939	1 999			

Copra.

EXPORTATION OF COPRA BY PRODUCING COUNTRIES.

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
German colonies:				
Former German E. Africa.....	5 421	4 242	(1)	(1)
Togoland.....	180	163	(1)	(1)
New Guinea and dependencies.....	14 523	17 394	(1)	(1)
Samoa.....	10 237	11 201	(1)	(1)
	30 370	32 907		
United States, Philippines.....	138 573	141 200	76 000	(1)
French colonies:				
Ivory Coast.....	22	22	(1)	(1)
Dahomey and dependencies.....	350	304	(1)	(1)
Caroon.....		1	(1)	(1)
Indo China.....	7 550	7 982	(1)	(1)
New Caledonia and dependencies.....	2 501	2 856	(1)	(1)
French possessions in Oceania.....	8 683	6 113	(1)	(1)
	10 175	17 275		
British possessions:				
India (year ending March 31).....		32 387	31 901	38 804
Ceylon.....	41 750	31 197	59 555	
Federated Malay States.....	8 481	7 831	9 430	14 732
British Borneo.....	537	509	655	(1)
Sarawak.....	100	193	71	(1)
Seychelles.....	2 500	2 735	2 084	3 071
Mauritius.....	2	8	90	(1)
Tonga.....	12 025	11 298	3 481	(1)
Fiji.....	10 590	13 030	8 056	(1)
Brit. N. Guin. (year end Mar. 31).....	1 077	1 009	807	1 220
Solomon Isles (British).....	205	182	213	205
Gilbert and Ellice Islands.....	2 103	(1)	(1)	(1)
Brit. E. Afr. (year ending Mar. 31).....	1 874	1 611	1 589	1 612
Zanzibar.....	11 501	9 482	9 603	10 138
Gold Coast.....	792	630	640	(1)
Nigeria.....	98	90	98	(1)
Trinity.....	754	1 433	524	(1)
Jamaica.....	8	21	32	(1)
British Guiana.....	(1)	58	57	(1)
	101 090	114 580	132 861	170 472
Dutch colonies:				
Java.....	91 622	84 650	78 800	70 827
Macassar.....	38 004	37 822	20 579	
Sungai, Menado, Gorontalo.....	33 914	30 070	26 648	172 847
Pangar.....	14 383	17 351	17 617	
	178 883	160 800	152 635	243 971
Portuguese colonies:				
Portuguese E. Africa.....	4 004	(1)	(1)	(1)
	1472 1013	1475 8611	1361 4361	170 472

(1) Figures not available, (2) 1st half-year.

COPRA TRADE OF IMPORTING COUNTRIES.

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
<i>Asia</i>					
<i>China</i>	148 090	183 258	190 440 (1)	82 956	(1)
<i>India</i>	1 332	981	549 (2)	573	(1)
	146 734	182 277	190 990	82 383	.....
<i>Japan (Yok.)</i>					
<i>Yokohama</i>	48 212	45 537	33 305 (2)	14 882	(1)
<i>Others</i>					(1)
	48 212	45 537	33 305	14 882	.....
<i>Europe</i>					
<i>Belgium</i>	21 778	25 774	10 552 (1)	11 118	(1)
<i>France</i>	6 744	7 170	6 957 (2)	4 707	(3)
	15 034	18 604	12 509	6 411	.....
<i>U. S. A.</i>					
<i>U. S. A.</i>	25 005	24 595	31 144	13 090	(1)
<i>Exports (year ending June 30)</i>					
<i>Exported for consumption</i>	17 153	31 707	18 047	25 266	43 686
<i>Imports</i>	167 302	153 506	112 610	96 363	131 371
<i>Others</i>	47	92	312	68	369
	167 349	153 414	112 328	96 295	131 018
<i>Kingdom</i>					
<i>Others</i>	(1)	(3)	14 412	12 837	(3)
<i>U. S. S. R.</i>					
<i>U. S. S. R.</i>	2 527	2 068	2 558	3 038 (4)	3 070
<i>Others</i>					
<i>Others</i>	91 730	102 230	100 635	109 420	210 288
<i>Others</i>	78 014	78 350	82 356	77 108	106 845
	13 716	23 880	18 279	32 312	103 443
<i>U. S. S. R.</i>					
<i>U. S. S. R.</i>	73 162	63 066	.....	.....	.....

Figures not available. — (2) 1st half year. — (3) Not specified. — (4) 11 months.

PRODUCTION OF COPRA CAKE IN IMPORTING COUNTRIES.

(calculated on quantities available for consumption within the various countries.)

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
Germany	73 367	91 138	97 950	41 191
Austria-Hungary	24 106	22 765	16 652	7 411
Belgium	7 517	9 302	6 297	3 255
Denmark	12 502	12 272	15 572	6 845
United States	8 570	15 853	9 323	12 633
France	83 672	76 707	59 164	48 147
United Kingdom			7 216	21 418
Japan	1 263	1 454	1 279	1 511
Netherlands	6 858	11 910	9 139	16 156
Russia	36 581	31 953		

Oil-palm.

EXPORTATION OF PALM KERNELS BY PRODUCING COUNTRIES.

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
German colonies:				
Cameroun	15 171	15 900	(1)	(1)
Togoland	13 287	11 630	(1)	(1)
French colonies:	28 458	27 638		
Senegal	1 327	1 764	(1)	(1)
Upper Senegal and Niger	243	847	(1)	(1)
French Guinea	4 826	5 135	(1)	(1)
Ivory Coast	5 251	9 799	(1)	(1)
Dahomey and dep.	39 346	37 296	(1)	(1)
Gaboon	495	351	(1)	(1)
Indo-China	8	42	(1)	(1)
British possessions:	51 496	52 242		
Nigeria	179 220	185 587	177 544	165 058
Sierra Leone	43 580	515 740	49 991	(1)
Gold Coast	13 467	14 864	9 899	(1)
Gambia	450	452	551	(1)
	236 717	718 643	237 968	(165 058)
	316 671	798 523	237 968	(165 058)

(*) Kernels of *Bulnesia* — (1) Figures not available.

TRADE IN PALM KERNELS OF IMPORTING COUNTRIES.

Countries	1911	1912	1913	1914	1915
metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
<i>Germany:</i>					
imports.....	250 664	201 408	235 917 (2)	113 205	(1)
exports.....	(3)	(1)	(3)	(3)	
<i>Hungary:</i>					
imports.....	30 040	30 000	27 043 (2)	1 127	(1)
exports.....					
<i>Italy:</i>					
imports.....	4 265	9 402	4 265 (2)	2 262	(1)
exports.....	790	595	700 (2)	608	(1)
<i>Belgium:</i>					
imports.....	3 475	5 837	3 475	1 504	
exports.....					
<i>Denmark:</i>					
imports.....	1 495	1 773	595 (2)	406	(1)
exports.....					
<i>France:</i>					
imports.....	1 988	2 077	2 980	3 135	18 463
exports.....	10	40	12	7	4
<i>United Kingdom:</i>					
imports.....	1 978	2 037	2 074	3 128	18 450
imports for consumption.....	(3)	(3)	(3)	66 665	(3)
<i>Sweden:</i>					
imports.....	204	251	110	343	(1) 519
exports.....					
<i>Netherlands:</i>					
imports.....	42 845	50 803	63 711	50 187	25 829
exports.....	43 110	48 139	57 503	35 534	84
	— 271	8 124	6 118	20 653	25 746

* *of Java, Siam, and Laos.*—(1) Figures not available. — (2) 1st half year. — (3) Not specified for 12 months.

PRODUCTION OF PALM KERNEL CAKES IN IMPORTING COUNTRIES
(calculated on quantities available for consumption)

Countries	1911	1912	1913	1914	1915
metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
<i>Germany.....</i>	125 332	130 794	117 958	56 602	
<i>Hungary.....</i>	15 020	19 953	13 521	561	
<i>Italy.....</i>	1 737	2 918	1 537	782	
<i>Denmark.....</i>	747	886	207	203	
<i>France.....</i>	989	1 018	1 487	1 564	9 226
<i>United Kingdom.....</i>				33 332	
<i>Sweden.....</i>	102	127	55	171	259
<i>Netherlands.....</i>		4 212	3 074	19 326	12 873

Residues of Sugar Industry. PRODUCTION OF BEET RESIDUES.

Countries	1941	1942	1943	1944
	metric tons	metric tons	metric tons	metric tons
<i>a) Dried slices.</i>				
Germany	453 030	832 110	847 000	845 940
Austria	212 490	396 190	348 100	338 790
Hungary	149 380	241 085	243 250	260 710
Belgium	75 435	86 515	60 595	60 000
Bulgaria	4 260	3 065	4 250	15 000
Denmark	39 525	49 300	46 500	48 360
Spain	39 590	30 590	50 100	50 000
United States	220 625	236 075	256 000	233 380
France	211 700	361 105	304 505	481 555
Australia	310	205	320	380
Canada	7 040	9 115	6 745	4 925
Italy	79 420	87 150	136 500	67 500
Netherlands	100 250	108 805	83 265	90 710
Romania	13 155	14 610	14 120	11 250
Russia in Europe	677 220	536 200	617 585	600 000
Asia	470	.....	.....	.....
Serbia	4 525	7 390	.....	.....
Sweden	48 275	42 325	42 200	43 805
Switzerland	1 155	.....	1 580	1 350
<i>b) Molasses.</i>				
Germany	181 212	332 844	338 800	348 370
Austria	84 990	158 470	130 240	135 490
Hungary	59 752	96 794	97 300	86 280
Belgium	30 434	34 606	27 838	27 000
Bulgaria	1 304	1 226	1 700	6 000
Denmark	14 610	16 720	18 600	16 340
Spain	15 836	15 836	23 040	.....
United States	91 850	94 700	102 676	104 332
France	84 716	144 442	120 602	75 022
Australia	124	82	128	152
Canada	3 170	3 646	2 686	1 970
Italy	31 688	34 800	54 000	27 000
Netherlands	40 100	43 522	33 306	30 884
Romania	5 262	5 841	3 648	4 500
Russia in Europe	270 888	214 480	245 934	240 000
Asia	188	.....	.....	.....
Serbia	1 834	3 000	.....	.....
Sweden	16 310	16 030	16 004	17 540
Switzerland	402	.....	632	540

FOREIGN TRADE OF VARIOUS COUNTRIES

TABLE 1. FOREIGN TRADE IN CEREALS, CEREAL PRODUCTS, AND OTHER FOODSTUFFS, 1901-1927

Country	Imports									
	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany:										
Barley	3,477,980	2,750,025	3,087,007	3,600,495	(2)	1,854	1,157	6,018 (1)	2,216	(2)
Beans	24,800	25,595	15,200 (1)	7,010	(2)	200	170	872 (1)	595	(2)
Lupins	17,013	11,280	6,080 (1)	8,557	(2)	850	478	727 (1)	637	(2)
Vetches	21,027	25,181	15,203 (1)	12,000	(2)	1,227	1,205	924 (1)	471	(2)
Austria-Hungary:										
Vetches	5,738	6,167	5,05 (1)	2,702	(2)	5,122	3,748	2,506 (1)	0,66	(2)
Belgium:										
Seeds and charcoal food derivatives, other than										
Barley	2,627	1,601	1,344 (1)	511	(2)	3,122	3,748	2,506 (1)	0,66	(2)
French colonies:										
India-China:										
Dried mungos						2,198	1,176	1,475	(2)	(2)
Netherlands:										
Wheat	15,014	17,005	21,616	(2)	(2)	12,505	11,001	17,398	(2)	(2)
Rye	7,169	8,575	6,551	(2)	(2)	1,073	2,802	3,895	(2)	(2)
Barley	11,260	8,308	11,187	(2)	(2)	8,410	6,326	7,597	(2)	(2)
Buckwheat	221	280	260	(2)	(2)	77	59	678	(2)	(2)
Beans and vetches	112	380	2	(2)	(2)	301	272	(2)	(2)	(2)
Dutch colonies:										
Dutch E. Indies:										
Dried foods						(2)	12,903	14,158	6,511	(2)
and residues of mangle						(2)	17,315	25,940	17,617	(2)

(1) 1st Indication; (2) Figures not available.

Residues of Milling Industry.
FOREIGN TRADE IN BRAN (wheat, etc.).

Country.	Imports					Exports				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany.....	1 420 717	1 606 250	1 414 256 (3)	1 010 703	(2)	16 422	16 768	23 284 (1)	13 130	(2)
Argentina.....						211 634	325 220	271 028	230 931	145 449
Austria, Hungary.....	439 281	147 882	140 024 (1)	66 331	(2)	60 415	37 183	30 501 (1)	23 680	(2)
Belgium.....	72 015	55 776	73 174 (1)	45 843	(2)	34 220	42 008	22 038 (1)	16 301	
China.....	89 408	59 368	127 501	106 815		34 535	45 137	62 109	25 803	
Denmark.....	43 576	55 277	45 221 (1)	21 305	(2)					
Spain.....	15	1 555	5 209	68	8	2 283	3 090	215	400	1 301
United States.....						109 713	83 290	4 670	5 281	
France.....	157 439	171 688	231 031	201 852	16 145	33 245	36 888	35 349	11 478	9 854
Algeria.....						19 303	14 031	19 935	14 116	9 128
Tunis.....						1 728	2 586			
United Kingdom.....	201 801	209 674	232 606	218 472	410 030	163 710	317 121	162 018	84 118	2 679
Australia.....	3	2 048	424			9 767	6 766	12 222		
Canada (year end, Mar. 31).....						95 106	81 077	84 450	105 552	52 739
British India.....	3 458	2 764	3 850	2 582	2 673	203 014	214 201	214 250	193 326	100 351
Italy.....	15 195	9 187	10 018	4 287 (3)	3 449	17 026	28 155	31 823	37 275 (3)	5 337
Japan.....		28 184	39 558	14 989	18 430					
Norway.....						36 251	21 256	15 975	10 692	(2)
Netherlands.....	90 695	49 646	43 826	(2)	(2)	56 393	66 575	63 937	(2)	40
Dutch Indies.....		7 177	7 172	9 645				824	401	
Russia.....						803 304	815 207	791 000	418 304 (1)	71 600
Sweden.....	58 413	58 486	55 780	46 369 (1)	20 430	3 280	2 020	1 270	2 360	
Switzerland.....	8 023	2 048	2 494	1 384		4 152	23 000	21 170	8 310	
Switzerland.....	11 151	14 608	16 151	6 314		10 808	11 394	11 120	11 120	

FOREIGN TRADE OF VARIOUS COUNTRIES

42

Country	Import									
	1931	1932	1933	1934	1935	1933	1932	1931	1934	1935
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	164 960	213 741	206 475 (1)	87 450	(1)	4 410	7 285	4 068 (1)	3 635	(1)
Argentina						2 519	2 159	2 574	1 301	.....
Austria-Hungary	9 610	13 870	5 816 (1)	2 002	(2)	26 247	15 747	11 079 (1)	2 544	(2)
Denmark	2 340	3 380	4 495	(2)	(2)					.....
France	42 557	20 718	50 410	76 680	71 740	3 687	2 260	9 645	28 864	16 779
Indo-China						110 759	107 097	238 270	(1)	(1)
United States	54 070	55 308	63 345	47 620	33 834	4 735	7 070	1 075	2 014	602
Australia	3	22	13	(1)	(1)	2 570	3 233	2 160	(1)	(2)
Japan		13 284	16 121	8 676	17 55					.....
Norway	2 883	2 767	1 500	2 520	446					.....
Sweden	260	5 069	4 007	1 209	.....	74	268	315	310	.....

(1) 1st half-year. — (2) Figures not available — 3 10 months.

FOREIGN TRADE IN VARIOUS MILLING RESIDUES (other than bran).

Country	Imports			Exports		
	1913	1912	1913	1914	1913	1914
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Australia:						
Wheat residues.....	.....	.....	.....	1,200	1,742	1,500
Austria-Hungary:						
Mill feed.....	12	2	.....	411	1,800	1,048 (1)
United States:						
Mill feed.....	.....	.....	.....	53,002	110,562	151,022
Italy:						
Wheat (hard) pollards (reexport).....	.....	.....	.....	22,203	22,627	25,192 (2)
Netherlands:						
Pollards.....	18,163	10,594	20,616	8,755	(2)	.....
Mill feed (wheat, rye, buckwheat).....	289,029	281,021	311,066	(2)	(2)	.....
Switzerland:						
Mill feed.....	5,878	5,543	5,037	5,628	(1)	.....
Wheat (soft)	.....	5,842	5,004	.....	.....	.....

REVENUE OF COTTONSEED
 FOREIGN TRADE IN COTTONSEED CAKES AND MEAL

Countries	Imports									
	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Austria-Hungary	1 701	3 882	4 989 (1)	1 839 (-)	15 031	15 304	18 245 (1)	11 060	(2)	(2)
Denmark	11 618	11 331	66 015 (1)	60 210 (-)	59	472	147 (2)	418	519	
Spain						1 104	248 615	391 502	430 666	
United States						66 617	2 554	4 977	5 551	96
United Kingdom	52 810	55 135	87 676	17 555	66 617	2 554	4 977	5 551	3 796	
Netherlands	198 337	201 600	275 122	229 849	216 024	149 239	313	224		
Russia										
Sweden		2 102	4 359	1 021						

1-1st half year; — (-) Figures not available.

FOREIGN TRADE IN COTTONSEED CAKES AND MEAL

Countries	Exports									
	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Denmark	1 728 142	2 122 550	2 322 555 (1)	1 034 458 (-)	467 872	543 476	455 894	285 355	664 539	
United States			214 341	166 168	188 365			7 042	4 010	2 733
United Kingdom	26 336	38 039	25 276	10 831	2 112					
Netherlands	4 211	1 804	9 435	13 080	21	172	1 794			
Sweden										

(1) 1st half year; — (-) Figures not available.

FOREIGN TRADE IN VARIOUS FEEDING CAKES (unnamed, etc.).

Countries	Imports					Exports				
	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	756 772	794 190	828 492	(1) 367 317	(2)	233 255	263 623	291 174	(1) 171 319	(2)
Argentina	.....	.....	.....	.....	.....	20 228	17 622	20 952	17 405	18 479
Austria-Hungary	56 332	42 662	32 210	(1) 12 157	(2)	26 007	29 725	31 235	(1) 16 884	(2)
Belgium	240 223	242 354	255 952	(1) 110 511	(2)	79 642	71 453	56 816	(1) 29 731	(2)
China	56	161	19	14	.....	695 393	544 513	793 836	723 519	.....
Denmark	313 330	269 019	287 095	(1) 151 085	(2)	16 169	16 145	15 135	(2)	(2)
Egypt	.....	.....	.....	.....	.....	89 173	86 778	62 977	79 687	111 670
France	142 705	154 068	101 573	73 711	3785	222 764	213 690	214 801	179 017	111 079
Algeria	4 711	3 009	2 681	2 112	1 768	.....	.....	.....	.....	.....
United Kingdom	77 681	45 481	78 288	89 546	118 708	50 690	60 293	35 867	20 894	26 232
Australia	77 693	458	146	(2)	.....	57	40	32	(2)	.....
Ceylon	.....	.....	.....	.....	.....	3 055	2 575	3 704	.....	.....
British India	18	52	.....	500	402	135 001	150 650	181 670	151 342	152 285
Nigeria	.....	.....	.....	.....	.....	126	2 136	2 810	1 254	(2)
Union of South Africa	.....	.....	.....	.....	.....	49 735	26 194	16 662	54 693	3 724
Japan	3 385	2 957	2 957	1 121	(1) 1 093	457	342	3 770	952	(3) 607
Italy	1 058 760	616 480	744 693	216 656	830 803	.....	.....	.....	.....	.....
Norway	28 782	20 665	30 122	37 068	(3) 29 186	.....	.....	.....	.....	.....
Netherlands	67 150	76 451	47 283	21 510	26 933	(2)	4 028	4 952	1 457	(2)
Dutch E. Indies	(2)	221	693	707	(2)	.....	.....	.....	.....	.....
Russia	.....	.....	.....	.....	.....	560 368	556 161	731 266	424 468	51 660
Sweden	154 636	151 853	145 416	168 805	(1) 82 171	12	456	1 113	.....	.....
Switzerland	11 120	34 664	29 928	17 668	(1) 11 111	.....	.....	.....	.....	.....

..... = less than 100 metric tons; (1) = 1916; (2) = 1917; (3) = 1918.

FOREIGN TRADE

Countries	Imports					Exports				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany:										
beet-slices.....	9 271	51 500	25 819	(1) 5 878	(2)	42 793	4 382	7 672	(1) 1 704	(2)
Austria-Hungary:										
beet-slices.....	14 147	13 367	11 277	(1) 6 615	(2)	14 405	17 462	18 086	(1) 413	(2)
Denmark:										
molasses.....	7	13	9	(2)	(2)	4 865	84	197	(2)	(2)
molasses feed.....	1 478	2 552	938	(2)	(2)	4 407	4 622	4 261	.....	.....
United States:										
beet-pulp (year ending June 30).....	1 218	.....	.....	.....	.....	.....	.....	.....	.....	.....
France:										
dried beet pulp.....	48 113	42 938	1	6	13	1 138	912	488	648	154
British Guiana:										
molasses.....	.....	.....	.....	.....	.....	5 184	5 198	6 970	(2)	(2)
Mauritius:										
molasses.....	.....	.....	.....	.....	.....	12	376	434	(2)	(2)
Norway:										
molasses.....	.....	5 058	6 704	7 087	(1) 6 143	.....	.....	.....	.....	.....
Dutch E. Indies:										
molasses.....	.....	.....	.....	.....	.....	(2)	3 536	18 208	12 355	(2)
Sweden:										
molasses feed.....	6 247	6 712	4 086	3 345	.....	1 696	1 136	.....	541	.....

(1) 1st half-year. — (2) Figures not available. — 1915 10 months.

Residues of Animal Origin.

	Imports					Exports				
	1941	1942	1943	1944	1945	1941	1942	1943	1944	1945
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
<i>Wool</i>.....	.....	.....	.....	.....	.....	2,292	3,374	2,744	1,701	101
<i>Wool, de-laine</i>	59	50	304	(1)	(1)	.....	.....	.....	.....	.....
<i>Wool, non-laine</i>.....	.....	.....	.....	.....	.....	12,310	14,548	8,029	8,078	9,033

..... not available. (1) 10 months.

WHOLESALE PRICES OF CERTAIN FEEDING STUFFS.

owing to the present condition of the international money market, divergence between the value in francs at par and that actually quoted in various markets is very marked. Consequently, in order to have comparable data we have converted the prices in francs at par to terms of pounds. Considering the pound sterling as practically equivalent to francs has been made of the exchange on London. A list of quotations is given below; the conversion coefficients can then be calculated by dividing rate at par by that obtaining on the particular date under consideration.

EXCHANGE ON LONDON AT THE END OF EACH MONTH.

(Value of the pound sterling relative to various currencies).

Date	United States	France	Italy
	Dollars.	Francs.	Liras.
<i>(Value of pound sterling at par)</i>	<i>(4.86665)</i>	<i>(25.221 f)</i>	<i>(25.221 l)</i>
January 1945.....	4.85 ¹ / ₂	25.11 ¹ / ₂	26.00
February.....	4.81	25.27 ¹ / ₂	26.10
March.....	4.80	25.45	27.55
April.....	4.79 ¹ / ₂	25.50	27.85
May.....	4.78 ³ / ₄	25.92 ¹ / ₂	27.62 ¹ / ₂
June.....	4.77 ¹ / ₄	26.16	28.45
July.....	4.76 ² / ₈	26.50	30.27 ¹ / ₂
August.....	4.63 ³ / ₄	27.73 ¹ / ₂	30.05
September.....	4.70 ³ / ₄	27.60	29.60
October.....	4.65 ¹ / ₂	27.53	29.95
November.....	4.70	27.78	30.95
December.....	4.73 ¹ / ₂	27.66	31.16

Residues of Milling Industry.
SPOT PRICES FOR WHEAT BRAN (per 100 kilos).

Date	Genoa	London	Minneapolis
	gold francs	gold francs	gold francs
End January	15.28	16.13-17.06	13.17-13.45
• February	16.16	17.06-17.68	11.59-12.14
• March	18.31-18.52	16.44-16.75	12.17-12.45
• April	16.02	17.06-17.68	11.60-12.76
• May	18.26	14.89	11.03-11.62
• June	13.30	15.20-15.51	11.66-11.94
• July	13.75	15.20-15.82	12.25-12.53
• August	14.27	16.75-17.06	11.00-11.39
• September	14.06	16.44-16.75	10.48-10.63
• October	13.89	17.99-18.61	10.60-10.75
• November	16.27	20.47-21.22	10.64-10.95
• December	17.09	21.71-21.96	10.56-11.15

Residues of Oil and other Industries.
SPOT PRICES FOR LINSIED CAKES (per 100 kilos).

Date	Genoa	London	Marseilles	New York
	gold francs	gold francs	gold francs	gold francs
End January	26.88	26.99-27.30	27.00	27.05
• February	27.01-28.23	27.01-28.23	27.00	27.12
• March	25.44	26.09	26.00	26.52
• April	23.58	24.20	24.00	24.00
• May	24.82-25.44	25.44	25.00	25.00
• June	25.44	25.44	25.00	25.00
• July	27.92-28.51	27.92-28.51	27.92	27.92
• August	28.54	29.16	28.54	28.54
• September	28.54	28.85	28.54	28.54
• October	27.92-29.78	27.92-29.78	27.92	27.92
• November	30.00-30.71	30.00-30.71	30.00	30.00
• December	31.02-31.64	31.02-31.64	31.02	31.02

SPOT PRICES FOR COTTONSEED CAKES (per 100 kilos).

Date	London	New York (C.O.B. New Orleans)
	gold francs	gold francs
January 1915	16.13	12.60
February	16.44-16.75	14.74
March	15.82	14.77
April	15.35-15.51	.....
May	16.13-16.44	.....
June	16.13	13.98
July	17.09	.....
August	19.85	.....
September	20.78	14.70-15.94
October	22.33	16.73-17.92
November	23.20-23.58	17.10
December	24.51-24.82	17.03

SPOT PRICES FOR GROUND-NUT CAKES (per 100 kilos).

Date	Gewen	London	Marseilles
	gold francs	gold francs	gold francs
January 1915	.....	22.02	.....
February	.....	.....	.....
March	.....	.....	.....
April	.....	.....	.....
May	.....	.....	.....
June	.....	21.71	.....
July	.....	21.71	12.85
August	.....	21.71-22.02	13.19
September	17.04-17.89	21.71	16.22
October	16.84-17.68	23.58	14.66
November	16.51-17.34	23.89	14.75
December	16.19-17.00	26.79	15.73

SPOT PRICES FOR COPRA CAKES (per 100 kilos).

Date	Genoa	London	Malacca
	gold francs	gold francs	gold francs
End January 1918	20,63-21,10	18,92	19,00
" February "	19,52-19,97	18,92-19,23	19,00
" March "	19,91-20,37	17,37	19,00
" April "	19,70-20,15	16,75	19,00
" May "	19,86-20,77	16,75-17,37	19,00
" June "	19,28-19,72	17,99	19,00
" July "	16,25-17,08	19,23	19,00
" August "	16,37-17,21	19,85	19,00
" September "	16,62-17,47	20,47	19,00
" October "	16,42-17,26	21,40	19,00
" November "	16,51-16,92	22,33	19,00
" December "	16,50-17,00	24,39	19,00

SPOT PRICES FOR SESAME CAKES (per 100 kilos).

Date	Genoa	Malacca
	gold francs	gold francs
End January 1918	21,56-22,03	18,00
" February "	20,64-21,09	18,00
" March "	21,06-21,51	18,00
" April "	20,83-21,28	18,00
" May "	21,00-21,46	18,00
" June "	20,39-20,83	18,00
" July "	16,66-17,50	18,00
" August "	19,70-17,25	18,00
" September "	17,03-17,47	18,00
" October "	16,84-17,26	18,00
" November "	15,68-16,51	17,00
" December "	15,38-16,19	17,00

SPOT PRICES FOR VARIOUS CAKES (per 100 kilos).

Date	Palm kernel		Maize	
	London		New York	
	gold francs		gold francs	
Jan. 15, 1915	17.06		16.04-16.01	
Jan. 16	17.37		20.24-20.81	
Jan. 17	16.44		17.38-17.96	
Jan. 18	15.51		12.70-13.01	
Jan. 19	14.80		12.78-13.94	
Jan. 20			12.82-13.98	
Jan. 21			12.83-13.99	
Jan. 22			17.08	
Jan. 23			16.83	
Jan. 24	17.37		17.02	
Jan. 25	19.23		16.86	
Jan. 26			16.73	

Common Standards of Measurement for Chief Concentrates
and their Metrical Equivalents.

Markets	Standard	Metrical equivalent
		kg.
<i>Bran.</i>		
Austria	100 kg.	.....
Hungary	Zentner	50
United States	Long ton	1 016
	Short ton	907.18
	100 kg.	.....
Kingdom	Ton	1 016
	Short ton	907.18
	Bazaar maund	37.251
U. S. Africa	Bag	60.40
	Quintal	100
	Ponl	16.38
<i>Oil Cakes.</i>		
Germany	Doppelzentner	100
France	Picoul	60.479
India	Ardeb	121.23
	Long ton	1 016
United States	Short ton	907.185
	100 kg.	.....
Kingdom	Ton	1 016
	Ton	1 016
	Bazaar maund	37.324
	10 Kwan	37.50
Philippines	100 kg.
Spain	Poul	16.38

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SECOND PART. ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

Oil of Citronella as a Preventive of Mosquito Bites.—GIVEN D. H. C., in *The Lancet* (S. 1, *Medicine*, Vol. XXIV, No. 2, pp. 2781—2782, 1906; London, February 1906).

JOURNAL
HYGIENE

An account of the good results obtained by the use of oil of citronella (*Nardus*) in protecting from mosquito bites the crew of a ship lying at Hankow. About half a drachm or less in the palm of the hand is sufficient to anoint the feet, ankles, hands and face, and to render immune for at least four hours, and often for the whole night. Citronella is very cheap if bought wholesale, although sold at 6d. an ounce retail. It lasted practically the whole summer and was used by nearly everyone on board.

The First 50 Years of the Moscow Higher School of Agriculture.—I. KATANOV, The Academy of Petrowskoié. The Agronomic Institute of Moscow, 44th years of its existence 1904-1905. In *Sobremennye Khrestomatiya*, Year LXXV, No. 26, I, CCXLIX, pp. 33-397; Petrograd, Nov. 1905. — E. MOROSOW, G., Tribute to the 50th anniversary of Petrowskoié, in *Livnoye Imenié*, Year XLV, No. 50, pp. 1-11, Petrograd, 1905. — III. BROTSKI, W., The Academy of Petrowskoié. The Agronomic Institute of Moscow, in *Zemledelecheskaja Gazeta*, No. 4, pp. 12-17, 1904. Petrograd, November 21, 1904. — IV. PRANICHNIKOW, D., Degrees in Science, *Ibid.*, pp. 127-129, 1904. — V. JACOBKINE, J. W., The Chair of Agronomy at the Academy of Petrowskoié, in *Sobremennye Khrestomatiya*, Year LXXV, Vol. CCXLIX, pp. 398-427, Petrograd, 1905.

AGRICULTURE
EDUCATION

The Higher School of Agriculture at Moscow is one of the oldest in Russia; the first of these institutions being founded in 1841 at Gori Gorkakh in Government of Moghileff.

Its importance and the influence which it has continuously exercised in the country justify its claim to be a "National Institution" comparable with the National Agronomic Institute of Paris, the National School of

Agriculture at Grignon and the Higher School of Agriculture at Leipzig, scientific organization and the continued adaptation of its teaching to modern necessities, are exemplified by the modifications introduced in recent years in curricula and methods, which not only relate to higher cultural training in Russia, but also bear upon the most important educational problems now pressing for solution in almost every country.

The creation of the Higher School is due to the great reforms of the second half of the last century. It took place in 1865 at the time of the abolition of serfdom in Russia. The institution began its existence in an epoch of the great awakening of social energies, when agriculture and conditions of rural Russia attracted the attention and activity of the people and the Government. The new School thus became by reason of circumstances at this epoch the intellectual centre of rural Russia. Its foundation owed its initiative to the Agricultural Association of Moscow, and it met with such favour in ruling circles that in 1861 a decree signed installing the school on the historic estate of Petrovskoe Simeonovskoe, situated within a few miles of the ancient Capital. The estate cost some £27,000; it contained 714 desiatines (1 desiatine = 2.7 acres), of which 219 were under forest, 129 were arable lands, 68 under grass, 65 under vegetable and ordinary gardens, 22 occupied by lakes or remaining 217 by roads, buildings etc.

Since its foundation, the Higher School has passed through four different periods.

During the *first period*, from 1865 to 1873, it bore the name of "School of Agriculture" and its avowed object was to spread useful knowledge in relation to agriculture and forestry. It was open to all who desired instruction in these subjects, no diploma of secondary education being required for admission. During this period, out of 1111 students, only 158 had diploma of higher or secondary education. The normal period of study was 3 years, but students were allowed free choice of the course of study, permitted to settle for themselves the time during which they wished to study; and were not compelled to undergo any examination. Of the 1111, only 82 went through the complete curriculum. It is an interesting fact that of those who did pass through the full term, 77 per cent. devoted themselves afterwards to agriculture. So far the teaching accomplished its object.

It was during this first period that there were laid and afterwards developed the truly scientific foundations of higher agricultural education, based on a solid preparation in natural sciences during the 2 years of study. The important courses in chemistry, physics, botany, plant physiology, anatomy, zoology, animal physiology, and agricultural chemistry, were organized by the leading professors of these sciences, included some of the most eminent scientists. This tendency, far from being weakened, gradually gathered strength and still constitutes the best and most characteristic traditions of the Higher School of Moscow.

The *second period* lasted from 1873 to 1880. In the new statutes of

object of the academy was described as "scientific instruction in agriculture and forestry". At the same time, the academy was transformed into a school of Agriculture of the higher class, *i. e.* it was provided with a curriculum of studies obligatory on all students, with obligatory examinations. The length of the course of studies was 4 years and admission was limited to those students who possessed a qualification equivalent to that of secondary education institutions.

The positive element of the new statutes consisted in a better and precise definition of the objects in view. Later on, there was a desire to give instruction a more practical orientation. Thus, in 1883, authorities required that, in the special agricultural courses, instruction in natural sciences should preponderate; that experimental work should be increased; that instruction should be more practical, the objects entering round the farm attached to the Academy itself. From the end of this year 1883, the students were required to carry out some farming work during the summer vacations. Later on, in 1886, access to the academy was made conditional on an apprenticeship in private agricultural undertaking.

The *third period* is the shortest and most unsettled in the School's existence. In 1886, the statutes were modified and the Academy of Agriculture and Forestry became one of Agriculture alone.

However, it became impossible to apply the new statutes to a great extent in 1890, in consequence of political agitation, admission to the Academy was prohibited by the Government and for a time the school ceased to exist.

The *fourth period* began in 1894 and still continues. Some months after its closure, the Higher School of Agriculture of Moscow was reopened under the name of "The Agronomic Institute of Moscow". The object of the Institute, according to the new statutes, consisted in higher agricultural education and in the teaching of agricultural hydraulics. This last was a valuable innovation. From the first years of its existence the Institute endeavoured to accommodate itself to new requirements and had modified the instruction by enlarging the scope of existing courses, and introducing new courses of study. Thus, in 1913, a section of Ichthyology had been created with the object of serving as a basis for scientific instruction in culture (which is of enormous importance in Russia) and of preparing specialists in this branch of work. This new department is thoroughly fitted in all that concerns scientific material and teaching staff. There are 5 professors, besides 2 acting and 7 assistant professors.

The subjoined table, drawn up by Professor PRILANICHNIKOW, shows recent development of the Institute as regards the teaching of natural sciences and compares the number of professorships in the University of Natural Sciences with that in the Institute.

The above table shows that the Faculty of Natural Science (at the University) has only one chair of Agronomy while the Agronomic Institute (Moscow), although its instruction in natural sciences is almost the same, has a much larger number of professors of agronomy.

Table showing Comparison between Number of Professorial Chairs in the Faculty of Natural Science in the University and in the Agronomic Institute of Moscow in Natural Sciences

	Faculty of Natural Science in University	Agronomic Institute of Moscow		
	Professors	Active Professors	Assistant Professors	Total
<i>Natural sciences: Physics, Meteorology</i>				
Chemistry Botany Zoology				
Mineralogy Geology Animal Phys- iology	11	10	3	1
<i>Agronomy I, Agricultural Chemistry</i>				
Applied Geology Plant Breeding				
Selviculture and other branches of plant cultivation	1	6	—	6
<i>Agronomy II, Stockbreeding and allied branches</i>	0	3	3	6
<i>Agronomy III, Economic bases of agri- culture</i>	0	4	1	5
<i>Agricultural Machinery</i>	1	2	—	2
<i>Mechanical sciences: Pure mechanics</i>				
Theoretical and applied mechanics				
Descriptive Geometry Astronomy				
Surveying	7	5	1	3
<i>Road Engineering, Special courses</i>	0	6	1	7
Total	20	36	6	45

With regard to details of the Institute's organization, the system of instruction and obligatory examinations at determined dates is replaced by a system under which the student is permitted to choose the subject which he prefers to study. The methods of testing the knowledge acquired by students and their work are generally left to the faith of the professors, who hold half-yearly examinations. The number of examinations for different groups of students depends on the section or branch of instruction selected by them. The students themselves are to decide in what order the practical experiments in the laboratory or science rooms shall be conducted, and in what order the subject of examination shall be taken, etc.

In view of the great awakening of agricultural activity which has taken place in Russia during the last 10 years, the number of students necessarily increased considerably. Whereas, formerly, the total number did not exceed 300, it now reaches 1500. Moreover, the number of students possessing a diploma of higher education, viz. in 1914 there were 280 and in 1915 there were 236.

The Institute received a new and very strong impetus in the last year during which M. A. W. KRIVOCHENNE was at the head of the Ministry of Agriculture. Thus, in 1912, the number of professorial chairs was increased so that while formerly there were only 21 professors and 16 assistants, there are now 30 professors, 9 acting professors, and 40 assistants. The expenses have risen from some £10,000 to over £23,000, and the expenditure on scientific material has increased from £4,000 to £6,000 per annum.

The law which empowered the Minister of Agriculture to open experimental stations at the higher schools of agriculture has contributed to the further scientific activity of the Institute. This law has permitted the addition to the Institute of a series of new experiment stations fully equipped and having in view not only educational objects but also scientific research of a general and local character. The following research stations are already at work: Plant breeding, Zootechny, Phytopathology, Agricultural Engineering, Flax Culture. In a short time there will be experimental stations for apiculture and horticulture. The station has its own staff (77), one director with a good number of assistants.

Considerable grants are allowed to the experiment stations. Some already fitted with a series of laboratories, museum collections etc., over £10,000 was allotted to the stations. The former chairs of Botany and Zootechny are being similarly developed, with the creation of laboratories and the addition of a series of new professorial chairs. Sometime ago, the Institute proposed to reconstruct the Forestry School, and the Minister of Agriculture proposed adding two new branches of activity to the Institute: 1) preparation of specialists; 2) for agricultural engineering; 3) for technical chemistry (manufacture of chemical products). These 2 branches of instruction are of exceptional importance for Russia. Suffice it to say that there have been discovered, in the basin of the river Volga, beds containing some 500 million tons of phosphorites; the use of chemical manures in the country is increasing yearly.

According to the figures furnished by Professor FOKRINAYLOV, there have been turned out from the higher school of Moscow in the 50 years of its existence, 2,792 agriculturists and foresters (the latter numbering about of which number 1,179 have come from the Academy and 1,613 from the Institute).

An interesting feature of the students' life has been the growth of a real spirit of association. There are at the Institute many students' associations with very different aims and objects: 1) a relief fund to which graduates from old students may be also subscribed; 2) a student's Committee for the distribution of grants for study; 3) a reading club; 4) a library of works of general culture; 5) a publishing society; 6) a club of social economy with a library and a committee to which is entrusted the task of distributing residential quarters in the "zemstvo"; 7) a fishing club; 8) a forestry club; 9) a horticultural club; 10) a teachers' training club; 11) a photographic club, and so on. There are, moreover, district

societies of students which have for their aim the study of the climate and agricultural conditions of each district.

The agricultural school of Moscow has had a profound and lasting influence and gained the esteem of all interested in the agriculture of Russia. An esteem, says KATAEV, founded on the fact that it has been practically an Agronomic University, always endeavoring to go up to its scientific mission, and taking as its basis a solid preparation in natural history; counting among its professors some of the best, and striving to turn out students not only scientifically trained, but active agriculturists and good citizens.

CROPS AND CULTIVATION.

284. The "Fredia" Dewmeter. — EREDIA, F., in *L'Agricoltura Italiana*, No. 10, 1904, pp. 107-114, with 1 photograph.

AGRICULTURAL
METEOROLOGY

This is a new apparatus for measuring the fall of dew, designed by EREDIA of the Central Bureau of Meteorology, Rome. Its component parts (shown in the figure) are as follows: A Dewar receiver in the form of an open cup with a diameter of 11.28 cm., equal to a surface area of 100 cm² exposed to the atmosphere. The receiver is placed in a wooden box and supported on two pieces of wood which raise the cup into contact with the upper rim with the fixed annular covering of the wooden box. Against the wall of the box is a clockwork action, *A*, which controls a lever mechanism, the spring being attached to a fixed rod *b*, whose upper extremity articulates with a lever having its fulcrum at *c*. The other end of the lever carries a pin which acts as a stop for a movable circular cover of wood. The upper surface is pressed down by the end of the spring *e* which can move on the pivot *g* to which its end is attached. The apparatus works in the following manner: when exposed in the open air, in order to obtain a measurement, the clockwork is wound up so that the spring (attached to the lever mechanism) is released exactly at sunrise; as a result, the stop of the circular movable cover ceasing to act, this latter, pushed by the spring, moves on the pivot *g* until it completely covers the opening of the Dewar receiver over which it fits exactly. In addition, the bevelled edge of the movable cover fits exactly into the annular cover of the box, closing it tightly, thus preventing evaporation of the dew collected at the bottom of the cup. In case the measurement is not carried out at once. To carry out the measurement, the Dewar cup is uncovered by turning the circular cover to its extreme position and a pyramed fitting is placed on the fixed circular cover of the box and its extremities fitted into split metal sockets. The tripod stand, the screw *m* whose milled head *n*, on turning, moves the micrometer screw ending in a point at its lower extremity. The circle round the head of the micrometer screw is divided into 50 equal parts and moves at a tangent to a millimetre scale *p*. One complete turn of the circle corresponds to a revolution of the scale and thus the movement of the screw can be measured to an approximate accuracy of 0.02 mm. Zero on the scale corresponds to the position where the point of the screw touches the bottom of the

To obtain the amount of each fall of dew, the point of the screw is adjusted as just to touch the surface of the water in the cup, an easy task,

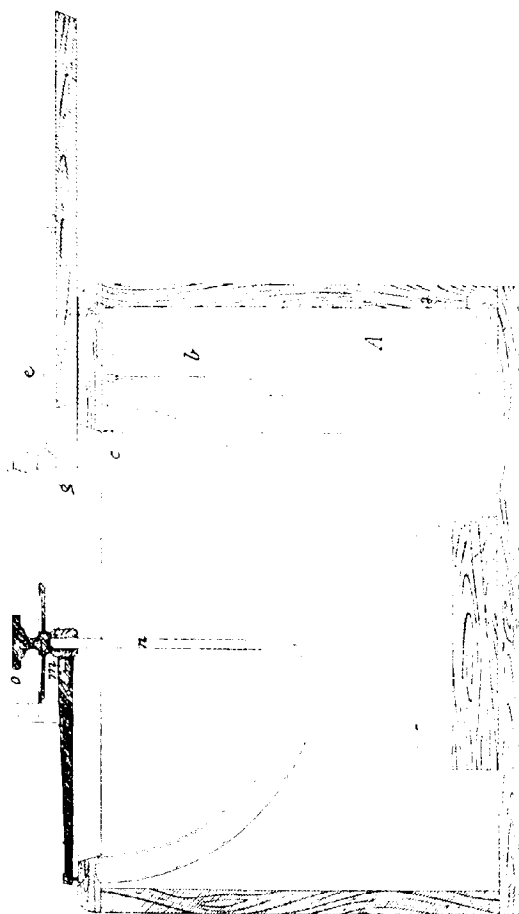


Fig. 14. Dewmeter - Vertical section.

the screw has only to be made to coincide with its mirror image in the mirror.

The total number of millimetres through which the graduated circle has turned, and any fraction of a turn, indicate the depth of the water in the cup.

If h equal the depth, and R the radius of the sphere whose area is multiplied by the water, the volume of water can be calculated from the formula $V = \pi h^2 (R - \frac{1}{3}h)$. To see if the measuring apparatus is properly set, turn the screw n till its point touches the bottom of the cup, when the scale should be at zero.

To avoid the above formula and to simplify the calculations, the apparatus is provided with tables showing the corresponding volume of water for each volume of h .

SOIL PHYSICS,
CHEMISTRY
AND
MICROBIOLOGY

385 - The Displacement of the Potash and Phosphoric Acid Contained in Certain Rock Substances Used as Fertilizers. — ANDRÉ G., in *Comptes Rendus des Séances de l'Académie des Sciences*, Vol. 162, No. 3, pp. 133-136, Paris, 1916, 1916.

In a previous article (1) the writer has shown that the prolonged saturation, in the presence of distilled water, of a microcline felspar with different salts used as fertilisers and which are normally present in the soil, caused the liberation of a certain amount of the potash contained by the felspar. The nutritive solutions present in arable soil are derived from this double decomposition which is the more thorough the finer the division of the solid elements.

The writer has continued this study on glauconite (a hydrated silicate of iron and potassium) which varies considerably in composition according to its origin. The sample employed by the writer contained 7 per cent of potash. The samples of 10 gms. were ground and passed through sieve No 70, after which they were well pulverised for 130 hours in the presence of 1 gut. by weight of different salts.

The results obtained are given in the following table:

Salts added in presence of water	Potash (K_2O) yielded to solution		
	grammes	In 100 parts by weight of glauconite	As percentage of total potassium contained in glauconite
None	0.0230	0.23	3.24
Calcium carbonate	0.0402	0.40	5.67
Sodium chloride	0.0398	0.39	5.52
Sodium nitrate	0.0508	0.50	7.17
Ammonium sulphate	0.0706	0.70	9.87
Calcium sulphate	0.0394	0.39	5.50

Considerable quantities of potash were thus set free, the amounts being comparable to those obtained from microcline felspar. The sodium chloride and especially the nitrate of sodium, had a stronger action in liberating

(1) See B. February 1914, No. 99

the potash of the glauconite than upon that of the felspar. The same amount of felspar yielded, in the same time, only 3.25 and 3.21 per cent of the contained potash. The action of calcium carbonate is more marked upon glauconite than upon felspar. The potash liberated from felspar by the same agent only amounted to 2.38 per cent of the total potassium content. The same may be said of the action of calcium sulphate. A maximum potash displacement was obtained in the presence of ammonium sulphate, when it amounted to nearly 10 per cent of the total potash. Ammonium sulphate had given a similar result in the case of the felspar, the potash displaced was a little less (7.38 per cent). Thus the amount of potash dissolved out from very finely ground glauconite is larger than that obtained from felspar, and the part which this mineral may play as a potassic fertiliser is far from negligible.

In order to put the conclusions derived by this method on a broader basis, attention was next paid to apatite. The object was to ascertain the amount of phosphoric acid capable of being removed by double decomposition when powdered apatite is ground in the presence of water and certain soluble salts used as fertilisers. Apatite is considered to represent a form of phosphoric acid which can only be assimilated by plants with great difficulty, on account of its crystalline structure, hardness, and very slight solubility under the conditions under which it occurs in the soil as a result of the disintegration of the primitive rocks.

Four experiments were made in each of which a powdered Ontario apatite (containing 39.33 per cent of phosphoric acid) was subjected to vigorous grinding for 1.34 hours in the presence of water and of 1 gm. by weight of the following substances: ammonium carbonate, sodium nitrate, potassium carbonate; these substances being chosen from the compounds met with in the soil. After grinding, the mixture was filtered, washed with distilled water and the filtrate examined for phosphoric acid. The result was five times in the case of the ammonium carbonate, although during grinding fresh additions were made of this salt, on account of its volatility. Similar results were also obtained with the nitrates although, according to certain workers, *precipitated* tricalcic phosphate should be slightly soluble in the presence of these salts. On the other hand, the potassium carbonate displaced a certain amount of phosphoric acid, 0.0139 gms. P_2O_5 to gms. of apatite, which corresponds to 0.35 per cent of the phosphoric acid present in the original material. This confirms the statement of some writers, who consider that potassium carbonate acts as a solvent for tricalcic phosphate in the soil. The addition to farmyard manure of a certain quantity of tricalcic phosphate has often been considered advisable, since the ammonium carbonate produced by the fermentation of manure has been regarded as capable of dissolving a small amount of phosphate. The experiment here described shows that scarcely any tricalcic phosphate is thus dissolved, this is also in agreement with practical observation; the operation is consequently of little advantage to agriculture.

METHODS
OF SOIL
CULTIVATION

386 - **Improved Summer Fallowing.** - HITIER, H. in *Comptes Rendus des Séances de l'Académie d'Agriculture de France*, Vol. II, Year 1916, No. 3. Paris, 1916.

M. HITIER reports upon a pamphlet by Count ALFRED DE HUGUES, *La méthode de Culture JEAN*, which is the result of an enquiry ordered by the Union du Sud-est des syndicats agricoles on M. JEAN's method of farming which consists essentially in :

1. - Exclusive use of the cultivator or Canadian harrow, completely doing away with the plough.

2. - One-crop farming of cereals simply interrupted from time to time by a forage crop, thus obtaining extreme economy of equipment, reduction of teams and great saving of labour.

One bullock driver kept during the whole year and one for the period intervening between harvest and seeding time, together with some hands for threshing are all that are needed for 55 acres of cereals. M. JEAN at his estate of Bru, Commune of Cavanac near Carcassonne in the département of Aude, has successfully practised this system for the last 10 years.

As soon as the grain is cut and stooked, and before it is carted away, the stubbles are immediately worked over with a cultivator so as to prevent loss of moisture by capillarity and to favour the aeration of the soil and promoting microbiological activity. Riding cultivators fitted with 15 pairs of teeth and levers for regulating the depth of work are used ; the first time a great depth need be attained, it is sufficient just to loosen the surface and form a dust mulch which will diminish capillarity and absorb any rain or dew which may fall, thus rendering easier the next dressing with the cultivator which is given 10 or 15 days after the first, and, where possible, across it, with larger triangular blades if the flexible spring teeth are not strong enough.

Every 10 or 15 days the cultivator is drawn over the fields, till seed time, each time increasing the depth of loosened soil by an inch or two, the soil being kept moist by the mulch will not demand much more power for the greater depths, while at the same time the whole field gets completely freed from weeds.

This system is especially recommended for regions in which a long period elapses within harvesting and sowing, such as the South-west of France.

MANURES
AND
MANURING

387 - **Green-Manuring in India** (1). - DOBBS A. C., in *Agricultural Research Institute of India Bulletin* No. 50, 55 pp., VI Plates, 1 Diagram. Calcutta, 1915.

The use of vegetation of all kinds for manure (usually leaves and stems) collected and transported to the fields (when it could not be turned to better account, has been perfectly familiar to Indian cultivators from time immemorial. Green-manuring (the turning in and burial of the crop in the soil upon which it has grown), however, though not unknown in the country, has not been nearly so widely distributed as it should have been.

(1) See B. February 1916, No. 147.

The attention of the Agricultural Department has long been turned to this important question, and as early as 1882, experiments were made in green-manuring at Cawnpore, followed by others at Nagpur, Benares, while dating from 1905, field experiments were carried out in most every Province of India. Important laboratory experiments were made in Madras, Assam, and at Pusa. The above-mentioned Bulletin is a compilation of all the reports relating to this work, and of articles appearing in other publications, and serves as a general report of the results hitherto obtained. It also gives a short sketch of the work which is being done in this direction at Pusa, and at some of the most important experimental stations of some provincial centres.

The question of green-manuring in India presents special difficulties, owing partly to the climate, and partly to the economic conditions obtaining there. The drought that prevails for half the year over the greater part of India is succeeded by the hot damp period of the monsoon. The length of the dry season prevents the formation of permanent pastures of leguminosae and necessitates continual cultural operations, which as well known, exhaust the organic matter of the soil. During the monsoon, tropical luxuriance of vegetation is promoted which might be expected to redress the balance. That it does not do so, appears to be due principally to three causes :

1) The use for fuel (which is very scarce) of all spare organic matter, including cattle dung, and as much as is not required of the stems of such crops as occupy the ground for the whole of the monsoon season.

2) Insufficiency of rainfall in many districts, which precludes the profitable cultivation of both a full monsoon crop and a cold weather crop on the same land.

3) The growth, for food purposes, of crops like rice which yield a relatively small proportion of straw to grain, and while occupying the ground for only part of the monsoon, yet leave insufficient time, during the remainder, for a second crop to mature ; with the result that the ground is frequently left fallow or uncultivated.

In order for green-manuring to be advantageous, the crops used must not take the place of other crops of primary importance (forage, fuel) or interfere with the cultivation of main crops. The advantages of green-manuring depend, as a rule, upon the utilisation of a shorter or longer period of the monsoon during which the ground might otherwise be uncovered. In the various systems of green-manuring are conveniently classified according to the length of this period, that is, according to the time of sowing or planting the main crop for which the manuring is regarded as preparation.

1) Main crop *rice*, transplanted usually about six weeks after the first monsoon showers.

2) Crops (like *tobacco* in Bihar) which are planted at the end of the monsoon, and the cultivation necessary for which precludes the maturing of a monsoon crop ; and valuable cold weather crops which require the com-

servation of a considerable part of the monsoon rainfall for the production of a full yield.

3) *Sugarcane, jute and garden crops* which are sown at the beginning of the hot season on un-irrigated land.

4) *Other crops grown on irrigated land* and which are thus to a great extent independent of the monsoon.

Rice. — The most important recent development of green-manuring in India has been in connection with the rice crop. Experience has shown that the most economical way of growing rice and the method almost universally adopted in India, is to sow the seed in a seed bed and to transplant the seedlings in puddled land, when sufficient water has been accumulated. The interval between the first monsoon showers and the transplanting of the seedlings can be profitably utilised for the growth of a green manure crop. Under favourable conditions, the seed of the latter can be sown even at the end of the preceding cold weather, and the young crop will survive the hot weather and be ready to take full advantage of the early part of the monsoon.

Plants which have been successfully used for green manure in the different provinces are: *Crotalaria juncea*, *Phaseolus Mungo*, *Dolichos biflorus*, *Sesbania biflorus*, *Sesbania aculeata*, *Tephrosia purpurea*, *Melilotus alba*, *Lathyrus sativus*.

Tobacco and valuable cold weather crops for un-irrigated land. — Green-manuring for these crops differs from that in practice in connection with rice, from the fact that the manure cannot be puddled in, and therefore requires a long time to rot; on the other hand, there is a longer time available before the land is required. The green manure crop can be sown on the early rains in May and ploughed in as near July 15 as possible, the tobacco being transplanted 8 weeks later. The following plants have been used with good success for green manure: *Crotalaria juncea*, *Eleusine Catjang*, *Sesbania aculeata* etc.

Jute, Sugar Cane and Garden Crops. — The growth of a crop for green manure is out of the question on typical jute land, but in parts of the Rampur, Pabna and Mymensingh districts, *Crotalaria juncea* is sown in October and ploughed in as green manure for the jute crop, though in many cases the stems and tops are removed for various purposes, and only the roots are left in the ground. As green manure for the sugar cane are chiefly used: *Tephrosia purpurea*, *Crotalaria juncea*, *Guizotia abyssinica*; for betel *Sesbania aculeata*; for ginger, the leaves of nux-vomica (*Strachos Nuxvomica*) and those of *Phyllanthus Emblica*; for onions, garlic etc. *Crotalaria juncea*. In the Punjab, *Cyanopsis psoraloides* is used in addition to the latter plant.

Irrigated Crops. — The green-manuring crop (especially *Sesbania aculeata*) is grown during the warm season, while the principal crop is cultivated in the autumn-winter season.

Seeds and Plants imported into United States, 1913.—In U. S. Department of Commerce, Bureau of Plant Industry, Inventory No. 34, pp. 547, Plates I-VI, and Nos. 35 pp. 565, Plates I-VIII. Washington, September-November 1913.

These inventories published periodically by the Bureau of Plant Industry at Washington are intended to form a complete record of the thousands of new and more or less valuable plants introduced into the United States.

The dangers from the introduction of plant diseases and the great expense of this work to private firms led the United States Government to undertake the responsibility of this work which concerns the general welfare of the nation.

Descriptive and bibliographical notes are appended to the various introductions and where possible, cultural observations from the place of origin.

I.—Nos. 34 728 to 35 135. The explorer in charge draws special attention to the following plants introduced during January 1 to March 31, 1913, and also pears (*Persea americana* Miller), from Mexico:

No. 34 855 from San Pablo, Campeche, a thin-skinned fruit with small seeds; reported to be of very superior quality.

No. 34 856 said to be the finest and largest fruits in Merida, a place noted for its fine avocados.

No. 34 851 from the Pincio gardens, Rome.

No. 35 121 from Caracas, Venezuela; yellow-skinned variety of very fine flavour; altitudes of 1400 metres with low rainfall.

Red Nut tree (*Piratinera alicastrum*, Baillon)

No. 34876 from Merida, Mexico, branches used as fodder in dry season. Hardy ornamental shrubs suitable for the trying climates of the Great Plains.

C—Corylus—Cotoneaster—Lonicera—Populus—Prunus—Tamarix:

Nos. 34 784 — 34 805 from Novosibirsk, Russia.

Large grasses:

No. 34 807, *Poa pallens*, resembling Kentucky blue grass, from Buenos Aires.

No. 34 818, *Eragrostis superba* Pyritsch from South Africa. One of the best native pasture grasses on the high veldt 3500 to 5500 feet; common sandy soils in British Bechuanaland with rainfall not more than 10 inches.

evia rebaudiana (Hemsley):

No. 34 883 from Paraguay; herbaceous perennial, leaves containing a glycerin many times sweeter than sugar.

[4531]

No. 34 777 from Merida, Mexico, very large fruits.

No. 34 913, fruits of enormous size on trees 7 feet high; probably of value on account of high yield of papain.

plum:

No. 34 851, *Prunus brigantia* from Nice, France.

No. 35 133, Chinese Yangtaw, *Adiantum chinensis*, female vine from Chelsea, London.

Persimmon: (*Diospyros kaki*) from Okitsu Japan:

No. 34970. Fruit medium size, average weight $\frac{1}{2}$ lb., round and flat, firm, not very juicy, of very good quality after removal of astringency.

No. 34971. Fruit medium large, more or less oblate; flesh fine, juicy, of good quality when the astringency is removed.

No. 34972. Fruit large, 1 lb or more, conical in form; flesh fine, tender, very more or less astringent at first, but very sweet when soft, suited for dried fruit.

No. 34973, from Hiroshima Japan. This variety produces the best dried persimmons in Japan.

"Sacred Ear Flower" (*Cymbopetalum penduliflorum* Baillon):

No. 35039, imported from Guatemala. Anomalous plant dried flowers used to flavour chocolate.

***Kerstingiella geocarpa*, Harms:**

No. 34926 - 34927, from Togoland, Africa. An edible bean which matures underground like the ground nut.

"Olanamba" (undetermined):

No. 34933, an edible root from Angola used in place of potatoes.

Kafir corn: *Holcus sorghum* L.

No. 34941, from selected seed, with large white grains and drought-resistant.

II. Nos. 35136 to 35666, introduced between April 1st and June 30th 1913.

Chinese Hawthorn (*Crataegus pinnatifida*):

No. 35486 from Tsinan, Shantung, China; a large fruited variety, hardy and frost-resistant; fruit of good flavour and makes a unique preserve.

Wild Pear (*Pyrus ussuriensis*):

No. 35394, from Harbin, Manchuria, probably the hardiest of the genus; fruits small and inedible; useful in breeding experiments.

Grape hybrid (*Vitis amurensis* \times *V. riparia*):

No. 35396, obtained by M. Mijurin, Kozlof, Tambok, Russia; fruits small and good flavour.

Mountain Ash (*Sorbus aucuparia* L.):

No. 35395, from same source as preceding; fruits pleasant and sweet.

Red currants (*Ribes* spp.):

Nos. 35398 and 35399, from Krasnoyarsk, Siberia; very hardy.

Hazlenut (*Corylus mandshurica*):

No. 35288, Maxim from Harbin, Manchuria, very resistant to cold and drought. Shells very thick and hard; kernels small. Useful in breeding experiments.

Jujube (*Ziziphus jujuba* Miller):

No. 35253 from Liohing, Shantung, China; seedless or with soft edible kernel, ringed or girdled to increase the crop.

No. 35255 - 35664, The scarlet jujube; fruits the size of small eggs.

No. 35410, *Ziziphus trimera* Poir, introduced as a stock for *Ziziphus jujuba* in the tropics.

Medjoul Date (*Phoenix dactylifera* L.):

No. 15, 164 from Morocco.

Raspberry (*Rubus biflorus quinqueflorus* Focke):

No. 37, 167 from Soochuan, China, golden-yellow fruit of good flavor, from Arizona.

Tropical Melon (*Sicana odorifera*):

No. 161, 169 from Tampico, Mexico; scented flesh makes excellent perfume.

159. - Habitual Presence of a Micro organism in the Roots of Crucifers.
in *J. E. and F. E. Bull. ent.* Nov. 12, 23, 24, pp. 171-178. 1914. Nov. Dec. 1914.

The writer records the presence of a micro-organism peculiar to Cruciferae, living habitually on the roots and observed by him on the roots of mustard, turnip and horse-radish. These micro-organisms are particularly on the swellings which are often observed at the point where the secondary roots emerge. They are of the bacillary chain type.

Further experiments will be necessary to determine whether this organism, which culture experiments have shown cannot be compared with *Phaenodiplhora*, has the faculty of fixing atmospheric nitrogen. So far, it has been demonstrated as belonging to the oligonitrophilous hypothesis which is founded on the supposed capability of Cruciferae to fix atmospheric nitrogen and so explains their beneficial action on manures, is therefore not devoid of foundation.

160. - Variations in Mineral Composition of Sap, Leaves and Stems of the Wild-Grass Vine and Sugar-Maple Tree. SHERB, O. M., Chemist, Kentucky Agricultural Experiment Station in *Journal of Agricultural Research*, Vol. V, No. 1, pp. 65-72, 1915. Dec. 10, 1915.

During the last three years, samples of the sap from the vine (*Cordyline*) have been collected and analysed to determine 1) whether the mineral composition of the sap varies in different parts of the vine at the same time; 2) whether it varies during a single season in the same part of the vine; and 3) whether it varies during different seasons.

The results of the analysis show that the water, calcium and potassium content of the sap are fairly constant when collected at two different parts at the same time during the same year, while the silica, iron, aluminum, phosphorus and chlorine are the large variable constituents depending upon the time and point of collection. More organic matter is found in the sap at a point on the main branch 20 feet from the root than is found closer to the ground or on new branches. The silica, iron, aluminum, calcium, magnesium and sulphur however, are found in greater quantities in the new branches, thus showing that the minerals accumulate in the leaves. Certain constituents, *viz.*: silica, iron, aluminum, magnesium and phosphorus, may be about the same in the sap when collected from two different parts at the same time, but vary widely when collected the following season. A further point of interest is that while the content of lime to magnesia is fairly constant for different parts of the same vine, that of potash to soda is variable.

examination of the sap at different times of the year shows a concentration of minerals towards the end of the sap flow, or when new leaves develop, compared with the beginning of the new year. The order of magnitude of the variations in the various constituents is as follows: sodium, chlorine, iron, aluminium, silica, phosphorus, sulphur, magnesium, calcium and calcium.

Considerable variation in the mineral composition of the sap occurs during periods of the day, an increase generally being found during the day and a more constant composition during the night.

The variations in the composition of the sap of the sugar maple tree have been determined.

The mineral content of the sap was higher in 1914 than in 1913, the great variations being with the sulphur and phosphorus. Comparing the sap of the maple sugar with that of the water maple, large differences in mineral constituents were found, and the large variations in the ratio of the lime to magnesia and potash to soda show that these differences are not simply to the dilution of the sap by water in the soil.

The Effect of Heating Seeds upon the Development of the Plant. Experiments made in Russia with Wheat. (Worobiew S. *Trudy Khim. i Biol. Nauch. Akad. Nauch. Kieva*, 1908, Kiev, December 17, 1908.)

The very limited number of observations regarding the action of different factors upon the plant previous to the vegetative period, induced the author to undertake, at the Kiev Polytechnic Institute, experiments to the view of determining the effect of somewhat high temperatures, upon the growing plant but upon the plant embryo. This heating was compared to the artificial drying of the plant while still in an embryonic condition.

The experiments were carried out in pots with seeds of hard wheat (*Triticum durum*). In one set of pots the "Armaoutka" variety was sown (seed commonly used was taken in this case; this is a mixture of three varieties), while in the remainder were planted seeds of a pure variety belonging to the "Koubanka" variety.

The amount of water given to the pots, was 160 to 20 per cent of the amount required to saturate the soil. The seeds were subjected to heating for 20 minutes at a temperature of 80° C. The effect of heat upon germination of the "Armaoutka" seed may be summarised as follows: firstly speaking, the germination capacity is not diminished (68 per cent against 69 per cent), but in the case of the unheated seeds, the maximum germination (40 per cent) occurs on the fourth day, while in that of heated seeds the maximum germination (37 per cent) is observed on the sixth day. The seeds used were from the harvest of the preceding year. Determinations of the germination capacity of grain harvested 2 years previously gave very different figures; that of the unheated seeds being 32 per cent, and that of the heated 63 per cent. The germination capacity of grain from a harvest spoilt by rain decreased still more, of the unheated 8 per cent, 70 per cent germinated and of the heated seeds 70 per cent. High temperatures, therefore, have a distinctly injurious effect upon

the embryos of old and spoilt grain, while they do no harm to grain sown in normal weather.

The numerical results of these experiments are summarised in the appended table.

As regards the experiments with the variety "Arnaoutka" being a pure line, the results are too variable for any definite conclusion to be drawn. This shows once more the necessity for using seeds from pure lines in experiments of this kind.

In the case of the pure line, on the contrary, the difference in the yield from similarly treated pots is very slight, never exceeding 1 per cent.

A tendency towards increased yield is observed in the case of grain grown from heated seed, whatever may be the degree of the damping of the soil. It is interesting to note that heating the seeds gave the best results where the soil received the smallest amount of water. Thus, with the same total yield (10.52 gms.) the pots sown with heated seed (Nos. 11 and 12) produced 7.12 gms. of grain, while the plants grown under similar conditions, but from unheated seed, produced only 6.37 gms. of grain. It is seen, on comparing other data, that heating increased the yield as follows: with 20 per cent of the total amount of water required for the saturation of the soil, 11.70 per cent; with 40 per cent of this amount, 8.2 per cent; with 60 per cent, 5.1 per cent. It results from these figures that, as the plants receive a large amount of water, heating the seed promotes sowing only increases the yield to an insignificant extent, and vice versa.

It may be taken that this increase is due to the fact that plants sown from heated seeds, and which have grown without the necessary amount of water, undergo some kind of structural modification; they are 716 mm. height only 716 mm. against 818 mm. for plants from unheated seed; the leaves of the former weigh 27.6 per cent of the weight of the seed (Nos. 11 and 12), while those of the second weigh 32.9 per cent (pots Nos. 5 and 6). The plants grown from unheated seed, having more leaves, less seed (both as regards absolute weight and relatively to the weight of the seed); the assimilating apparatus of these plants, being less perfect, would be less productive. In support of this hypothesis, a table is appended embodying the results of research on leaf anatomy. These show that heating seeds occasions the formation of tissues with smaller cells, the length of the stomata and the dimensions of the mesophyll cells, the lower values in the case of plants obtained from heated seed, and under conditions where soil humidity is 40 per cent and 20 per cent of total saturation; great humidity of the soil (60 per cent), equalises the qualitative characteristics of the tissues.

The writer concludes that heating has a great stimulating effect on the embryo and promotes in the plant a tendency to xerophytic structure; this is shown in its reduced height, in the decrease in the total weight of the leaves and in the dimensions of the cells. Seeing that xerophilous plants best withstand want of water, it can be considered that in places where water is abundant, heating the seed produces no modification.

tion in the structure of the plant, while where water is somewhat scarce heated seeds produce plants with modified structure for the purpose of enabling them to withstand drought.

392. — **Hourly Transpiration on Clear Days as Determined by Cyclic Environmental Factors** BRIDGES, L. L. and SHANTZ, H. L. (biophysicist and Plant Physiologist of Plant Industry, in *Journal of Agricultural Research*, Vol. V, No. 12, 1916, plates VIII-IX, Washington, D. C., January 3, 1916).

These transpiration experiments were carried out at Akron, Col., during 1912-1914, with a view to determining, as far as possible, the relative influence of various environmental factors on the transpiration of different plants. The plants, which included wheat, oats, rye, sorghum, alfalfa and amaranthus, were grown in large scaled pots of the type used in water requiring experiments (1). The environmental factors were recorded in terms of solar radiation, air temperature, depression of wet-bulb thermometer, evaporation from free water surface and wind velocity.

The transpiration curves of the various plants may be grouped into two classes: 1) those showing a flattening of the curve in the forenoon and accompanied by corresponding changes in the environmental factors, and, 2) those showing no such change. The cereals belong to the former group and the forage plants and amaranthus belong to the latter.

The change in the transpiration curve of the cereals appears to be due to some change in the plant resulting in a reduction in the transpiration rate below what would be expected from the form of the curve during the early hours of the morning. The hourly transpiration rate of the cereals on clear days increased steadily, though not uniformly, from sunrise to a maximum value which was reached between 2 and 4 p. m., after which it fell rapidly to the night level. The transpiration graphs for sorghum, alfalfa and amaranthus were somewhat more symmetrical with respect to midday, reaching their maximum between noon and 2 p. m., after which they fell approximately with the radiation.

During the night, transpiration at Akron is very low, being only 3 to 5 per cent of the transpiration during the day light hours. The radiation intensity rises in advance of the transpiration when the values are expressed as percentages of the maximum and falls either in advance of the transpiration, or with it, according to the plant considered. Radiation may therefore be looked upon as the primary causative factor in the cyclic changes.

The transpiration graphs usually rise and always fall in advance of temperature.

Computation of the correlation coefficients between transpiration and the various environmental factors show the radiation, air temperature and wet-bulb depression to be correlated with transpiration approximately to the same degree, the figures being:

radiation coefficient	0.82 to 0.89
temperature	0.77 to 0.80
wet-bulb depression coefficient	0.75 to 0.85

The squares of the coefficients indicate the amounts of transpiration estimated by the several factors. Thus radiation determines the transpiration to the extent of from 0.67 to 0.77. The remainder 0.13 to 0.23 is ascribed to other factors and since the squares of the coefficients for these factors exceed this amount, it follows that these factors are also intercorrelated with the radiation. This conclusion is supported by the much lower radiation coefficients for temperature and wet-bulb depression obtained during the night when radiation is nil.

Though the observed and estimated evaporation rates are in satisfactory agreement this is not the case with transpiration, the value as estimated by the method of least squares being greater than that actually observed. This indicates that the plant undergoes changes during the day which modify its transpiration rate. These results therefore support the opinions of other workers that plants under conditions favouring high evaporation do not respond wholly as free evaporating systems, even if they are supplied with water and no visible wilting occurs.

Carbohydrate Transformations in Sweet Potatoes

By H. HASSLERBERG, TH. SKRIVER, and J. HAWKINS, L. A. (Plant Physiologists, Fermentation Investigations, Bureau of Plant Industry in *Journal of Agricultural Research*, Vol. V, No. 14, pp. 517-565, Washington, D. C., December 27, 1915).

It has previously been noted that the sugar content of sweet potatoes remains comparatively low while they are in the ground, but that immediately after the roots are harvested, there is a transformation of starch into sugar which takes place more rapidly at that time than at subsequent periods. This sugar formation thus appears to be a phase of the carbohydrate metabolism of the sweet potato which is initiated under certain special conditions.

Experiments have therefore been carried out to investigate this process carefully. Determinations were made of the carbohydrate transformations taking place during a period of 10 or 12 days immediately after unearthing potatoes and at a second subsequent period. The potatoes were kept at temperatures of 30°, 15.5° and 5° C.

The rate of starch conversion was found to vary with the temperature, that at 15.5° to 30° the process soon approaches its maximum. The rate of accumulation of cane sugar varies with the temperature, being very rapid at 30° during the first 10 days, then rapidly diminishing. At 5°, little cane sugar is produced during the first 10 days, but the rate of accumulation subsequently increases rapidly. The formation of reducing sugar at 30° is sufficiently rapid to provide all that is used in respiration and allow a considerable accumulation, but less than that at 5°. At the lower temperature, there is a marked accumulation of reducing sugar at first which may be followed by a slight subsequent loss. The diminution in the production of reducing sugar during the second period at 5°, notwithstanding the continued conversion of starch, and the large increase in cane sugar during this period, suggests that the excess of reducing sugar is converted into cane

1. See B. March 1916, No. 252.

sugar. Also, the concentration of reducing sugar always remains comparatively low, even at low temperatures when respiration is at a minimum. It appears therefore, that with the exception of the sugar used for respiration, the reducing sugar is transformed into cane sugar as fast as it is formed from starch. Probably the series of reactions is reversible and the final equilibrium between the starch, reducing and cane sugar depends on the temperature, with the effect that at higher temperatures the system permits a greater concentration of sugar. This would also account for the rapid translocation of sugar immediately after lifting the roots.

The initiation of this transformation coincides with the cessation of the flow of reserve materials from the leaves and occurs in potatoes left in the ground after the haulm has been cut. It is therefore concluded that the activity of the haulm inhibits the conversion of starch to sugar in the tubers of sweet potato.

394 - **Inheritance of Length of Pod in Certain Crosses.** - by BETTING JOAN.

Botanist, Florida Agricultural Experiment Station in *Journal of American Botanical Society*, Vol. V, No. 10, pp. 405-406, Washington, D. C., December 6, 1918.

The Florida velvet bean (*Stizolobium decringianum*) and the black velvet bean (*S. nigrum*) have one main genetic difference affecting pod length, and this genetic difference segregates in genetic fashion. It is completely dominant and acts as a multiplier with a value of about 1.52. There are also minor factors for pod length which also act as multipliers with a combined multiplying value (when double) of about 1.42.

395 - **New Varieties of Plants on Sale** by Vilmorin-Andrieux. Paris. 1918.

in *Journal de l'Agriculture française*, Year 80, No. 1, pp. 32-33, Paris, January 1919.

Among the new varieties of plants for cultivation placed on the market by VILMORIN-ANDRIEUX of Paris, the writer draws special attention to the three following:

1) *Very early black hybrid oat*. This interesting spring variety was obtained some 10 years ago at Verrières by crossing the Australian oat with the Joannette oat; it has recently been subjected to rigorous selection and is now well fixed. Height 3 to 4 feet, according to conditions of cultivation. It is vigorous and stools well. The panicles are well furnished, the spikelets contain 2 or 3 grains, slightly bearded. When sown at the beginning of March, it comes into ear early in June and ripens about the 20th of July, i. e. 8-10 days before the earliest varieties. It thus has three qualities: extreme precocity, abundant yield, resistance to rust and to lodging.

2) *Jerusalem artichoke*, obtained in the Verrière experiment. A robust variety doing well in poor soils, except in those which are impervious or too wet. The tubers, which are tinged with rose and regular round in shape, do not freeze in the ground and so can remain and be lifted at any time required. They can be used as food for man or beast.

3) *Chicory* (*Chicorée à café*). A vigorous plant, leaf entire, roots somewhat flattened, very regular in shape, 10 to 12 inches in length in

percentage of dry matter and very pure, thanks to the high content of carbohydrates and slight quantity of inorganic matter. It offers the double advantage of a high yield and small fuel requirement for preparation.

Plant Breeding in Cuba.—FARLEY D. S. and FERGUSON WILSON, in *The Journal of Agriculture*, Vol. XLIX, 12 pp. 555-568, 1915, Washington, December 1915.

Plant breeding in Cuba was begun in 1901, the year in which one of the authors was called to the island to organise the Government Agricultural Experiment Station at Santiago de las Vegas.

Naturally enough, the most important cultures were the first to receive attention. The testing of seedling sugar canes has been carried on for the past ten or twelve years at the Harvard Experiment Station, at Sagua near Cienfuegos. As the soils of the Soledad district do not give satisfactory results with chemical fertilisers, and stable manure is out of the question, the problem to be solved was the production of a sugarcane giving a good yield even in exhausted soil. A satisfactory solution has been found. In addition to the production of seedling canes which will maintain a profitable yield on poor soils, an effort has been made to obtain by means of selection, strains which will be resistant to root rot, a disease supposed to be caused by *Marasmius sacchari*. On virgin timber lands, in which canes will often continue to give profitable results for twenty or twenty-five years without replanting; after this the plants die out, and must be replanted every third or fourth year. The cane usually begins to die in certain spots in the field where the growth is weakest and the disease spreads in concentric circles. Always, however, occasional stools survive in these diseased areas; an attempt has been made to obtain from these, by selection, some immune strains of the "Cristalino" cane, which is so satisfactory in Cuba from most other points of view. Unfortunately, the work was dropped before any results were obtained, but the question is one that promises to yield most valuable results.

Cuba offers a large field of work for the selection of tropical fruits. At present, there is no vine suited to hot climates, though some south European varieties are occasionally grown in Cuba with some degree of success. There is a native species, *Vitis caribaea* which, even in a wild state, produces juicy fine grapes about 3/8 in. in diameter, dark purple in colour, and might through hybridisation with some of the cultivated grapes give rise to a race which would be of the greatest value to tropical regions. Further, from its productiveness and vigour (this vine sometimes covers trees 18 or 20 ft high) it would form an excellent stock for grafting.

In the mountains of Cuba, there is a walnut tree, *Juclaus insularis*, producing nuts which compare favourably in size with the northern black walnut. The kernels are, however, difficult to remove from the shell and the partitions are thick. Through selection, this tree might be considerably improved and might be also of great value as a stock on which to graft cultivated walnuts (for there are very few nuts that succeed in the tropics). In Queensland Nut, *Macadamia ternifolia*, which has been introduced at Santiago de las Vegas has succeeded very well.

In all parts of Cuba, the mango is one of the most abundant of fruits.

There are two distinct races, *mango* and *manga*. The former is a tall tree sometimes 60 ft. high; its fruit is beaked at the apex and the seed rounding the seed is long and coarse. The *manga* is a low spreading tree or 40 ft. high, with more abundant but finer fibre. Two principal types of the *manga* race are distinguished and these are called, from the colour of the flesh of the fruit, the *manga amarilla* (yellow) and the *manga blanca* (white). There are also other races and types of mangos, the *Filipino* with very little fibre and of excellent flavour; the *Chino* and *manga* of Cienfuegos and the *Biscochuto* of Santiago de Cuba; the last is very limited in distribution, but very superior in quality. The most important work in mango improvement yet done in Cuba consists in the selection and propagation of some of these superior types. The mango seedling reproduces the type perfectly.

In order to improve the *avocado* (*Persea gratissima*), budded stock of selected varieties have been imported to Cuba from Florida. In Cuba a few selections have been made, but the work is only just beginning. The most important point in the selection of varieties is lateness of ripening; and throughout the island are found occasional seedling trees which hold their fruit all the winter.

For the improvement of the *añón* (*Annona squamosa*) the writers have crossed *Annona Cherimolia* with *A. squamosa* and *A. muricata*.

In Cuba, citrus fruits were formerly grown almost exclusively from seed. The Government Experiment Station at Santiago de las Vegas is doing the work of searching out and propagating desirable seedlings which are found growing half wild in neglected gardens and hedgerows.

Many of the most important tropical vegetables grown in Cuba (*Dioscorea Batatas*, *D. sativa*, *D. aculeata*, *Coleocasia*, and *Manihot utilissima*) are propagated asexually; the opportunity for selection is not lacking, however, since hybrid variation is much more common in the tropics than in temperate regions. Dr. JUAN T. ROLD has collected over 80 varieties of sweet potatoes from different parts of the island, and is now determining the comparative value of each.

During the early years of the Agricultural Station at Santiago de las Vegas, a great number of varieties of maize from all parts of the United States and Mexico were tested, but none proved to be well adapted to Cuban conditions. The common variety cultivated in the island was originally of a yellow flint type; the ears are unusually heavily protected by husks that completely close at the tip, and the husks, leaves and stalk are tomentose; this seems to protect the young leaves from the attacks of numerous small insects which are always seen working about them. The heavy husks protect the ears from the attacks of the corn weevil until the next planting season. The absence of glabrous varieties is apparently due to the work of small insects. Some of the dent maize imported into Cuba has occasionally been planted and has fertilised plants of the flint variety, giving rise to acclimatised hybrids. At the Santiago Experiment Station, they have begun to select the best of these, in the hope of fixing a type with long ears enclosed in heavy husks.

Testing of Agricultural Seeds in South Australia.—ANDREW K. W., in *Proc. Roy. Soc. South Australia*, Vol. XIX, No. 3, pp. 27-28, Adelaide, 1915, 1915.

Under the Federal Quarantine Act, the introduction into the Commonwealth of seeds or plants of over 140 species of noxious weeds is absolutely prohibited. Under the Federal Commerce Act, seeds imported must be genuine, and sound, fresh and clean, although no standard has so far been set up and discretion is allowed the customs as to what constitutes genuineness in this respect.

In the case of South Australia, samples of all agricultural seeds imported from abroad are taken at Port Adelaide, the Outer Harbour and the General Post Office Adelaide, by officers of this Department acting as Quarantine officers for plants, and submitted to another officer in this office who examines them to see what weed seeds they contain, and the quality of the consignment is gauged after germination tests have been made. No doubt exists as to whether they are suitable seeds to admit into the State, the Chief Quarantine officer for Plants for South Australia exercises powers conferred upon him under these Acts, and issues instructions for goods to be freed (where practicable) of impurities, or to be destroyed, or returned, to the country of origin.

The results of purity tests are not given (as in most seed laboratories) in percentage of impurities, but the method adopted is the same as that used in Canada; the number of weeds per unit weight of sample being given.

The germination tests are made in duplicate (two lots of 100 seeds

Experiments on the Germination of Seeds of Gramineæ.—KUNO, EIZO, in *Zeits. für Landw. Landwirtsch.*, Vol. 63, No. 3, pp. 285-312, Berlin, February 14, 1915.

Experiments on 14 species of grasses to determine the optimum conditions for germination.

In order to study the influence of temperature on germination, the seeds were kept in darkness and exposed to constant temperatures (at 20° or 30° C.) and also to temperatures varying during the course of germination from 20° to 30° C.

In order to study the influence of light (at a constant temperature of 20° C.) the seeds were placed in a thermostat, one of the sides of which was black. The experiments all being made in winter, the influence of the daylight was only of secondary importance, but the value of the tests is not diminished thereby.

The seeds were placed either on or between moist blotting paper, or in porous earthenware dishes saturated with water. The water was renewed every two days, to replace that lost by evaporation.

For each species, 4 lots of 100 seeds were taken, except in the case of *Poa annua* and *Allopecurus pratensis*, where it is difficult to distinguish between good and bad seeds, consequently for these two species a given lot of seeds was employed. Altogether some 45,000 seeds were tested.

The following were shown to be the optimum conditions :

Species	Medium and conditions of germination	Temperature	Date on which maximum number of seeds germinated	Percentage
<i>Panicum polyanthes</i> (L.)	Between blotting paper in presence of light	Constant, 20°C	4th day	100
<i>Dactyloctenium aegyptium</i>	Between blotting paper	Variable, 20-30°C	5th	100
<i>Amaranthus spinosus</i> L.	do.	do.	1st	100
<i>Heliotropium indicum</i> L.	do.	do.	6th	100
<i>Cyperus rotundus</i> L.	On blotting paper in presence of light	Constant, 20°C	10th	25
<i>Echinochloa crusgalli</i> (L.)	Between blotting paper in presence of light	do.	5th	100
<i>Aporosa distachya</i> L.	On blotting paper in presence of light	do.	4th	100
<i>Lolium aduncum</i> (L.)	Earthenware dishes in presence of light	do.	5th	100
<i>Lolium perenne</i> (L.)	Between blotting paper or in earthenware dishes	do.	5th	100
<i>Anthoxanthum odoratum</i> (L.)	Between blotting paper	Variable, 20-30°C	7th	20
<i>Alfalfa</i> (<i>Medicago sativa</i>)	a) On blotting paper in presence of light b) Between blotting paper	Constant, 20°C Variable, 20-30°C	7th	40
<i>Festuca pratensis</i> (L.)	a) Earthenware dishes b) Between blotting paper	Constant, 20°C Variable, 20-30°C	4th	100
<i>Festuca ovina</i> (L.)	On blotting paper in presence of light	Constant, 20°C	7th	100
<i>Poa pratensis</i> (L.)	Earthenware dishes in presence of light	do.	10th	25

The results are compared with those of other workers, and the following conclusions drawn :

1) Blotting paper is the best medium for the germination of all Gramineae.

2) Contrary to the opinion of NOBBE, light is absolutely indispensable to the germination of certain species.

3) A change of temperature from 20° to 30° C. (20° for 18 hours, 30° for 6 hours) has proved favourable in many cases.

4) A constant temperature of 20° C., with absence of light is favourable to very few species.

A constant temperature of 30° C. is unfavourable to most species, but for a few species, the germinating faculty should be tested under different sets of conditions.

"Lencino" Rice in Italy. — NOVATI N. in *Il Riformatore*, 1911, Year 51, No. 1, p. 17.

This rice had a more important position in Italy before the introduction of "Chinese ordinario" but it has still a considerable importance in some regions, Mantua, Venice etc. It does not do well in all soils, requiring deep lands, very little permeable, rich and somewhat clayey, on favourable conditions it gives excellent returns. Although now cultivated for a considerable time, it has not degenerated and retains its primitive character fairly well. It is vigorous in habit, fairly tall, stools well, and has fine panicles of length; high yield. It is very resistant to disease but liable to lodging. Ripens somewhat late but with selection, a sub-race has proved better.

It is a "hard" variety, i.e. very resistant to hail, or to loss of grains during threshing. It consequently requires vigorous threshing. It is much valued in commerce because it is easily glazed and has a fairly transparent grain. It is a kind deserving notice as it can probably be improved further by proper selection.

The Milling of Rice and its Effect upon the Grain. — See No. 114 of this volume.

The Cultivation of Cotton in Greece. — *Journal des Économistes*, 1911, *Revue Scientifique de l'Agriculture*, VIIIth Year, No. 1, pp. 17-180. (March, 1911.)

The following is an abstract of an analytical study of different types of cotton, indigenous, American, and Egyptian, grown at the Experimental Station of Setres (Macedonia).

Egyptian cottons did not prove satisfactory, turning out far from giving much waste, and a weak fibre. Its culture is to 10 to 15 per cent less than that grown in Egypt, with a loss in ginning 50 to 70 per cent more than average.

The "Chindako" is better, having a greater purity, but is 15 to 20 per cent inferior to the Egyptian Afilhoum.

The American varieties "Cleveland Big Boll" and "Russels Big Boll" and all others in outturn and strength of fibre.

Other American varieties named by the writer are of similar value, to that of American middling.

The general conclusion is unfavourable to Egyptian cottons, but it is hoped that, with suitable cultivation, cottons of commercial value can be acclimatized in Macedonia.

Cotton Hybridisation at the Botanic Gardens, British Guiana. — HARRISON, J. B. and BRANCKOFF, C. K. in *The Journal of the Botanical Association of British Guiana*, Vol. VIII, 1907, pp. 143-150. (Damerata, September, 1907.)

Numerous experiments made since 1902 on the cultivation of Sea Island cotton demonstrated that owing to the unsuitability of the heavy soil and meteorological conditions, this crop is unsuitable for the coastal region

of Guiana. The most favourable season produced a crop of only 200 lb. of seed cotton per acre. Some promising results were at first obtained in the seed selection of Egyptian cottons, but it was evident, as the result of various trials, that the different varieties would not yield lint in sufficient quantity to enable them to be grown at a profit. All the varieties, except the Buck, were found to be very susceptible to the diseases prevalent among cotton plants, more especially to anthracnose and to cottony rot.

As the result of these trials, efforts were directed towards raising crosses between the Sea Island and the native Buck cotton, with the object of combining the vigour and perennial habit of the latter with the quality of the lint of the former. These crosses have been bred to the 4th generation, of which 24 plants have been finally selected for the development of new strains.

Ten of these strains and specimens of two hybrids have been sent to the Imperial Institute for valuation and report. This report states that the object of the experiments has been attained and it will be important to learn how the yields and hardness of these long-stapled hybrids compare with those of the indigenous Buck variety.

The brokers' valuation of the lint from the different hybrid crosses varied from 11d. to 14d. per lb. with the best Barbados Sea Island at 14d.

335. — **Steps Taken to Preserve *Kokia Rocki*, a Wild Relative of the Cultivated Cotton Plant in Hawaii.** — YOUNG, ROBERT A., Office of Foreign Seed and Plant Introduction of Plant Industry in *The Journal of Heredity*, Vol. VII, No. 1, pp. 22-23, Washington, January 1916.

The rise of the science of genetics has given breeders a keen regard for the value of the wild relatives of important cultivated plants. One of the former may be of no economic importance. This is the case with regard to a tree growing wild on Hawaii, and called "kokio" by the natives. *Gossypium dryarioides* by SEEMAN, and *Kokia Rocki* by LAWSON. The tree was threatened with absolute extinction and was only saved by the efforts of the Office of Foreign Seed and Plant Introduction of the United States Department of Agriculture. The writer states that about 8 per cent of the native flora of the Hawaiian Islands is endemic and therefore it is of the greatest importance that these species should be preserved. Some "kokio" trees were found at Punawaawaa, in the island of Hawaii, on a bed of lava at a height of about 2700 ft. The average annual rainfall is 29 in. or less.

Gossypium dryarioides reaches a height of from 12 to 25 ft. It produces large brick-red flowers, each of which gives rise to a seed bearing several seeds covered with short reddish hair. The natives do not use the cotton, but strip the trees of their bark which they use for dyestuffs. The colour of the sap is reddish and is waterproof.

301. — **A Promising Coconut Clearing in Malaya.** — BROWN, L. C. (Late Inspector of Coconuts, F. M. S.) in *The Agricultural Bulletin of the Federated Malay States*, Vol. No. 12, pp. 445-446, Kuala Lumpur, September 1915.

The following is a brief history of some seed coconuts planted on an estate in Malaya in 1912.

60,000 nuts were purchased at a price of £7-12 s.; half of them

in the nursery in May and the other half in June. The number germinated was 3,000 or 88 per cent. The seedlings were planted out from November 12 to January 31, 1913, on 1104 acres of a free clay loam containing 25 per cent. sand. At the time of planting, the shoots were from 8 to 18 inches long but the end of the first year averaged about 12 feet. The first wood at base was formed at the age of 1 year 10 months and the first flowering age and buds appeared at 2 years and 5 months. The growth of the trees very even and the average height at this stage was 26 feet and average diameter 25 inches. The height of the wood at the base was 18 inches and the greatest number of rings (leaf scars) was 12. At the age of 3 years, the largest nuts were 4 inches long.

Thus, these coconut palms came into flower in the record time of 2 1/2 years from the time of planting the seedlings and bore nuts at the age of three years.

The writer attributes this remarkable growth to the care taken during the critical period in the life of the palms, *viz.* from germination to the third year and particularly at the time of planting out.

Production of Manna by Olive Trees in Algeria. BATTANDIER J. A., *Revue de l'Industrie et du Commerce*, No. 4, p. 108, Paris, February 10, 1915.

In 1901 an abundant production of manna by olive trees was recorded by the present writer. This rare phenomenon was again observed, towards the end of 1915, by M. DE PEYERIMHOFF, Inspector of Forests, Director of the Forestry Station of Algiers. In this latter case it appeared on the trunks of olive trees attacked by the larvae of *Cossus*, which bored out a number of galleries in the wood. The manna was particularly abundant and huge stalactites hung from the whole length of the trunk.

M. DE PEYERIMHOFF thinks the rarity of the occurrence is due to the fact that *Cossus* only very seldom attacks olives.

Experiments have been begun in order to attempt to induce this phenomenon at will, which, if successful will be of considerable practical importance.

On the Coagulation of *Hevea* Latex and a New Method of Coagulation. FAYON J. and GRANTHAM J., in *The Agricultural Bulletin of the Federated Malay States*, Vol. IV, No. 2, pp. 20-30, Kuala Lumpur, November, 1915.

When latex is allowed to coagulate spontaneously in open vessels, a peculiar slime or yellow scum forms on the surface. This surface scum is alkaline in action while the serum below is acid, thus showing two distinct processes of decomposition *viz.* an alkaline aerobic process and an acid anaerobic process. This latter is the basis of a potent anaerobic process of coagulation in which the latex is allowed to coagulate in tall cylinders so as to reduce the amount of aerobic decomposition.

Latex sterilised in an autoclave at 140°-150°C. remained uncoagulated for several days under sterile conditions, but on exposure to air or after coagulation with a little fresh latex, coagulation set in after 24 hours, showing that coagulation is dependent upon bacterial decomposition.

Latex heated to 60° - 100° C. and kept under sterile conditions does not coagulate spontaneously without putrefactive change, the serum becoming acid. Putrefaction, however, sets in later.

The writers conclude from these results that coagulation is not due to an enzyme but to bacterial action of a non-putrefactive nature.

There are therefore two kinds of bacteria capable of developing on rubber according to the conditions, the putrefactive organisms being inhibited at a lower temperature than the non-putrefactive organisms.

Experiments were then made to increase the activity of the non-putrefactive organisms by the addition of sugars and it was found that the addition of 0.2 per cent of dextrose brought about coagulation in 18 hours, the whole of the dextrose being completely decomposed. The addition of dextrose to sterile latex did not bring about coagulation.

Coagulation under anaerobic conditions is not uniform, since it depends on the constituents of the latex. This method, therefore, does not give a rubber of uniform quality.

197 Experiments on Sugar Beet Growing in the South West of France.

11, rue Cauchy, *Recherches Botaniques des Sciences de l'Agriculture des Suds*, 1914, No. 1, pp. 1-60, 127. Paris, January 1915.

In France, the cultivation of sugar-beet has been restricted hitherto entirely to the northern provinces. As this state of affairs is not without drawbacks and even danger, the writer has attempted the growing of the crop in other regions, particularly the South West. In 1914, experiments were carried out in the following departments: Lot-et-Garonne, Tarn, Dordogne, where tobacco is grown. Comparing the nature of the soils suited to the two crops, it was considered that where tobacco was cultivated the beet should also succeed: both require deep, moist, but not too rich soils and both are suited by clayey loams or by clayey chalk soils with a good supply of humus.

Owing to the scarcity of labour, the only experimental fields that received sufficient preparation were those situated in one of the fertile regions of the Causse du Quercy, in 1914, and those on the alluvial lands of the Lot valley, in 1915. The results in these two cases are given in the appended table and show that at any rate the sugar varieties of beet are capable of being grown with profit in South West France.

1) The average yield per acre in the Lot valley is slightly higher than that for the north of France (according to MALPEAUX, 1,308 tons per acre).

2) The average yield of sugar is at least equal to that obtained in the North of France.

3) The lands of the fertile regions of the Causse (a calcareous plain between the Lot, the Tarn and its tributaries) are equal in fertility to the alluvial lands of the Lot valley, as far as the sugar varieties are concerned.

On the other hand, distillery beets did less well in the Causse than in the alluvial soils where they showed a sugar content equal to that produced in the North.

4) Climatic conditions being the same for the 4 departments men-

Varieties tested	Results in 1914		Results in 1915	
	Cwt. per acre	Sugar content	Cwt. per acre	Sugar content
<i>Sugar</i>				
Amabilis	298.8	15.6	318.6	17.6
Black Wanzleben	278.8	17.4	320.2	17.4
<i>Distillery</i>				
Apple with green neck	286.8	7.5	312.9	14.2
pink	293.9	6.8	300.7	12.8
grey	286.8	9.5	312.9	11.5

gined above, it may be assumed without further trial that the lands similar to those of the Lot valley are well suited to this crop. Such are: those extending, in Dordogne, from Eyzies to Sarlat and from Sarlat to St. Payla-Grande; those of Lot and Garonne which lie between Fumel and Tournais passing by way of Villeneuve-sur-Lot and St. Lysrade.

18 - **Varieties of Strawberry Tested at the New York Experiment Station.** TAYLOR, O. M., in *New York Agricultural Experiment Station, Technical Bulletin* No. 401, pp. 105-161, Geneva N. Y., March 1915.

A description of 105 varieties of strawberry tested and examined during the last 3 years at the New York Agricultural Experiment Station. The kinds grown include newer varieties, with standard commercial kinds for purposes of comparison. As climatic and soil conditions have a great effect upon the crop, those obtaining at the Station are given, in order that a better opinion can be formed of the results of the tests of the different varieties.

Attention is drawn to the importance of the various properties of the strawberry plant, such as the seasons of blooming and ripening, the sex of the flowers, stolon production, productiveness, vigour of plant, resistance to disease and the size and quality of the fruit. The varieties are classified as follows: early or late bloomers; varieties maturing early or late; those that are prolific or scanty plant producers; very unproductive or very productive varieties; those growing rapidly or slowly; varieties susceptible to leaf spot (*Sphaerella fragariae*); kinds producing very large or very small fruit; varieties rating high in quality.

A list is then given of the 30 varieties that gave the best results in the cultivation tests at the Station, and finally a detailed description of the 105 kinds studied, with an account of their behaviour under the soil and climatic conditions obtaining at the Station.

The place of origin of the variety is given in each case.

409 - **The Cultivation and Manuring of *Oxycoccus (Vaccinium) carpus*.** — FRANKLIN H. J. in *Massachusetts Agricultural Experiment Station Report*, No. 190, Report of Cranberry Substation for 1914, pp. 91-117. Amherst, March 1915.

Frost Protection. In order to see whether cloth could be used satisfactorily to protect bogs from frost, a strip of new cloth was supported by wires held 3 ft. above the ground by stakes, about 9 square rods of rather dry grassy low land being covered in this way, the cloth being brought down to the ground to shut in the covered area on all sides. It was found that the cloth greatly retarded the loss of heat from the ground. A thermometer placed in the centre of the covered area, with its bulb 5 in. above the ground was more than $4\frac{1}{2}^{\circ}$ F. higher (2.2° C.) than a similar thermometer at the same elevation placed about 20 ft. outside the cloth. No frost formed on the covered ground, even when the surrounding ground was white with frost.

The writer estimates that the first cost of this means of protection fully installed would be less than £ 200 per acre, but the cloth ought to give good service for many years. He is of opinion that the use of cloth protection is to be recommended for bogs that are winter flowed, but for strictly dry bogs (without winter flowage) the expense is prohibitive, because the returns from such bogs are comparatively small.

Fertilising experiments. These were carried out with either one compound, or a mixture of 2 or 3 compounds; to one plot which was treated with a nitrogen-phosphatic-potassic fertiliser, lime was also applied. The amount of fruit picked was taken into account, as well as the losses in stored fruit. The yield varied from $6\frac{1}{3}$ bushels to $10\frac{1}{2}$ bushels per acre; both these amounts being obtained from a control (unfertilised) plot. The fertilisers consisting of 3 compounds increased the yield more than those consisting of 2; sulphate of potash was more efficacious than chloride of potash; liming had not much effect. Of the different compounds used, nitrogen increased the yield to the largest extent.

During storage, the losses varied from 22.22 per cent (check) and 37.5 per cent (complete fertiliser and liming). The nitrogenous fertiliser decreased the keeping property of the berries somewhat, as it made them more juicy. The fertiliser had no appreciable effect upon the size of the berries. The application of nitrogenous fertilisers during the beginning of the bloom seemed to stimulate and increase the setting of the blossoms and the fruit formation.

Maximum temperature at which flooding water can be used without damage to buds. — Some cranberry growers were afraid that if the temperature of the water of the June reflowage were too high, serious damage might be done to the buds of *Vaccinium*; the writer, however, found that an exceptionally high temperature: 86° F. (30° C.) did practically no harm to the buds.

Experiments in Italy on the Best Time for Pruning the Vine. — DALMASSO G. in *Giornale Year XXII*, No. 3, pp. 44-47, Conegliano, February 1, 1915.

The question as to whether it is best to prune the vine early or late has not yet been said to have received a satisfactory answer and it seems increasingly necessary to extend the observations made under different climatic, soil and cultural conditions.

Time of Pruning	No. of vines per row	No. of the row	Average yield per vine lb.	Composition of must		Index of ripening
				Sugar %	Acidity ‰	
After 15	106	IV	2,51	21.00	0.05	3.15
	105	XI	2,58	20.30	0.18	3.28
	Average of 2 rows		2,54	20.65	0.41	3.22
After 15	105	V	2,82	18.80	0.84	2.74
	107	XII	2.03	22.00	0.00	3.00
	Average of 2 rows		2.43	20.40	0.42	3.17
After 15	106	VI	2,80	21.15	0.03	3.05
	107	XIII	2.31	22.40	0.18	3.00
	Average of 2 rows		2.60	21.72	0.55	3.11
After 15	106	VII	2.11	20.00	0.75	3.11
	106	XIV	1.21	20.70	0.50	3.11
	Average of 2 rows		1.68	21.80	0.05	3.27
After 15	101	VIII	2.35	21.35	0.18	3.15
	107	XV	1.50	21.45	0.47	3.30
	Average of 2 rows		1.91	21.40	0.27	3.11
After 15	105	IX	2.61	21.15	0.18	3.42
	104	XVI	1.17	21.70	0.75	3.21
	Average of 2 rows		1.59	21.42	0.46	3.31
After 15	62	X	1.19	20.75	0.00	3.16

New investigations have been begun in the vineyards of the "Scuola Enologica" at Conegliano, on the 2 following varieties: a vine of the Italian Riesling variety growing on level ground and pruned according to the Guyot method, and a vine of the Rhenish Riesling variety planted on a slope. Although the data of a single year are only of a very relative value, still the results observed in the two cases were so markedly peculiar that they deserve immediate notice. They are given in the appended Table.

As regards *quantity*, late prunings (in spring) do not seem to have yielded such satisfactory results as autumn and winter pruning. The effect upon the *quality* of the product is less obvious. The continuation of the experiments will prove whether or not the observations of the first year represent a normal occurrence.

411 - Observations on the Cultivation of Direct Bearers in Savoy (France) in 1915

CARRIER F., in *Le Progrès agricole et viticole*, Year 36, No. 46, pp. 473-475 (Aix-les-Bains), November 11, 1915.

Observations made by the writer on 2 vineyards situated near Aix-les-Bains, on slopes of fairly calcareous nature but with clayey spots. The one with due southern aspect was very warm, dry and early, there being some places only from 20 to 30 cm. of soil above the rock. These vineyards have never been fertilised. The year 1915 being a very bad one for vines, many growers in this district only obtained grapes from direct bearers. Others also got fairly good crops from certain *vinifera*. Of these, the most attacked were the "douce-noire", or "corbeau", and the "crép", or "fendant roux". The writer obtained, in 1915, from his direct bearers a better crop than in 1914 with a slight treatment towards July 1915 (spots of mildew) the first applied for 8 years.

The following numbers are considered the best for 1915.

Old Hybrid Direct Bearers. — 580 Jurie does very well in the plain, and on hot and dry slopes it sometimes loses its leaves (1911 and 1915). It is the only direct bearer that has a high degree of acidity, even when barely ripe, which corrects the insipidity of the must of the greater number of the other hybrid direct bearers.

Of the *Seibel Old Hybrids*, 2044 has always proved very productive; 405 is very resistant to drought in the worst soils, even those that are calcareous; its fine bunches escaped the attacks of *Cochylis*; 2007 remains quite healthy without treatment; being exceedingly productive, it is necessary to prune it rather close; 1007 is very productive and very healthy; 209 bears largely with 1 or 2 treatments. Of the *Old Coudere Hybrids*, 200 has proved very productive, vigorous and healthy, its bunches and stems are better than those borne by 4401; 122-20, 106-51 and 7103 are also distinguished for their good grapes.

White Gaillard 157 has always proved a good producer; it is not vigorous and consequently needs grafting on poor soils; after 3 years it becomes chlorotic in the spring on calcareous soil.

New Hybrid Direct Bearers. — *Seibel Hybrids*: 2779, first and second period of ripening; very productive, vigorous, juice white; 2582, very

are less vigorous, bunches very long; juice coloured; 4501, extremely vigorous, habit of 405 but more productive; 4499, large producer, vigorous. These 4 kinds require 1 or 2 treatments. — 4609 very vigorous, fine fruit, very productive; 4643, 4683, 4620, 4630, varieties with very fine bunches, and grapes above the average; 4433 and 4438, large bunches; 4609 very vigorous, one of the hardiest varieties, very long bunches; 2734 very vigorous, habit and foliage same as Othello, excellent grapes with berry flavour. These 9 kinds are very resistant to mildew and can do with treatment in ordinary years. The following numbers require at least 2 sprayings and are only of average vigour; they are productive and have very fine compact bunches with large grapes: 4217, 4111, 3011, 3013 and 4065 (very early); the 2 last produce large grapes. On poor soils, these numbers require grafting, especially 4217 and 4217.

Among the *Seibels with white grapes*, the following are recommended: very resistant to mildew and very productive, sweet grape, requires good soil; 2709 and 4132 have fine bunches with large grapes; 4744 and 4745 require two sprayings with copper sulphate. The following numbers are vigorous: 4955 very productive; 4505, 4747, 4707, 4773, 4768, and finally 4076 and 4762, all very productive, belonging to the first and second period of ripening, 2859 (rose); 4900; 4964 all these numbers only require one application of copper sulphate; 2655, with very fine bunches, late setting, 4151 and 3013, all very productive of grapes for the vat and table, but less vigorous than the preceding. They require, at least, 2 sprayings and on poor soils need grafting.

Amongst the *Seibels with black grapes*, Nos. 2858, 5059, 4100, 4739 and 4940 have proved vigorous and very resistant. *Malique rouge* 809-2 and 1350-3 proved very vigorous, they require one spraying.

Chenivresse, or *Chazalon*, is delicate and susceptible to mildew, and needs 2 treatments.

Bertille Seyve Hybrids. — 313, a very good grape, first period, a little susceptible to Oidium; 822 vigorous, very good crop; 453, fine bunches with close fruit; 893, first period, excellent grape, very productive; 450 the Noah without foxy flavour but much more productive, with large bunches. All these Bertille-Seyve numbers of the first and second period are very resistant to mildew and can possibly do without spraying.

Condere Hybrids. — 272-60 is very vigorous and very productive in all fresh soils, unsatisfactory on the dry soils of the slopes, susceptible to mildew, 239-35 or Muscat du Moulin is vigorous and very resistant; it produces an excellent table grape.

Baco Hybrids. — Vines 1, 22A, Capéran, Petit Boné and Chasselas are all very resistant to mildew; the first is extremely vigorous.

In general, all the hybrids here mentioned grow best and are most vigorous in the plain, especially on damp soil; many are susceptible to rotting and the heat of the sun during drought; some ripen better in the sun than in dry years; such as for example 126-25 Condere, which ripens better in the shade than in the sun; 2044, 580 etc.

The grapes of direct bearers are generally fermented in the mixed with *vinifera* grapes, as they decrease the acidity and improve the colour of these latter; the wines obtained sell well for immediate consumption. On the other hand, even the original direct European-American bearers (Othello, Noah), are acclimatised in Savoy, and have now to a great extent their former foxy taste.

412 **Vine-Growing in California.** —SWETT, F. T., in *The Monthly Bulletin of the Division of Horticulture*, Vol. IV, No. 11, pp. 901-913, Sacramento, Cal., November, 1914.

At the present time, in California, the future of the grape industry, like that of the apple and peach industries, is decidedly uncertain. It will need the wisdom of legislators, the skill of technicians, and the cooperation of business men to carry it through the coming decade without incurring severe losses, the effects of which would fall heavily on growers of grapes on banks, on business men and on wage earners.

The growth of the grape and wine industry in California has been steady, continuous and rapid, as is shown by the increase in the average quinquennial returns of wine production from 1869 to 1914. The amount of wine produced in each five-year period, in round numbers, is 16 million, 21 million, 42 million, 71 million, 89 million, 102 million, 142 million, 187 million, 225 million.

There are now 170,000 acres of wine grapes. In addition, a large part of the product of table grape vineyards and of raisin grape vineyards goes to the wineries. This steady growth, which is due to high prices obtained by the growers, is in contrast to the violent fluctuations of the orchard business. The latter, with few exceptions, fell off greatly between 1900 and 1910, as is shown by the following statistics taken from the report of the State Board of Agriculture.

Comparative Table of Fruit Trees in California in 1900 and 1910

	1900	1910	%
Apples	2 878 169	2 482 762	86.3
Apricots	4 244 384	2 992 453	70.5
Pears	2 512 890	1 410 005	56.1
Cherries	686 891	522 304	76.0
Olives	1 530 104	836 347	54.6
Lemons	1 493 113	941 293	63.1
Pomelos	80 918	43 427	53.7
Almonds	1 601 947	1 166 130	72.8
Plums and prunes	9 832 713	7 168 705	72.9
Totals	24 852 180	17 564 326	70.7

HYGIENE OF LIVE STOCK

During the ten-year period, 1900-1910, the acreage of the above varieties of fruits dropped from 248,000 to 175,000, a shrinkage of nearly 25 per cent.

In the meantime, the vineyard acreage during the same time has grown to a total of about 330,000, composed of about 170,000 of wine grapes, 110,000 raising grapes and 50,000 acres table grapes. Nevertheless, owing to the heavy internal revenue tax levied recently by Congress on wines and on the brandies used in the fortifying of sweet wines, the wine-growers of the interior valleys have already cancelled contracts for at least 400,000 tons of grapes. The tonnage of table grapes that can be used this season by the wineries is, however, doubtful.

With a full crop of table-grapes, about 20,000 carloads are shipped, but during the last 3 years, an average of only about 6,500 a year were exported, with perhaps 1000 cars a year used in local markets. The rest are sold at a loss to the wineries. It is beyond dispute that table grapes have been over planted, an excessive and ruinous oversupply of mid-season grapes having been grown; there is, however, room for more early grapes of good quality and for more late grapes of good keeping quality.

The State Board of Viticultural Commissioners made an exhaustive study of the financial losses incurred by shipping unripe grapes and proposed a law which came into force in 1915, the "Ashley Standardization Law" which provides that grapes must contain a minimum of 17 per cent of sugar for all grapes except the "Emperor".

The Commission is also devoting its attention to the questions of replacing mid-season grapes by early and late kinds, and of grafting the "Zante", "Almeria" and "Emperor" varieties.

The writer states that there is a tendency among such owners of vineyards as have sufficient capital or credit, to replace every third vine with apricot, pear, almond, or some other fruit tree. He is of opinion that, in view of the great importance of the agricultural undertakings in California, it is increasingly necessary to study the economic problems, which at present seem to overshadow the technical ones, and in conclusion, agriculturists are reminded that agriculture, the one large industry that from present appearances can never be overdone in California is to be based largely upon general farming and animal industry.

LIVE STOCK AND BREEDING.

41. - **Studies on the Heredity of Rabies.** - KONRAD DANIEL in *Annales de l'Institut Pasteur*, Vol. XXX, No. 1, pp. 33-38, Paris, January 1916.

Work carried out at the Institute of Pathology and General Therapeutics at Kologsvár, Hungary. The writer had previously shown that the infectious matter of rabies is transmitted from the mother to the embryo. Subsequently to the publication of these articles, other experiments were made on the same subject with contradictory results. The writer crit-

icises these experiments and gives an account of his later researches, from which he draws the following conclusions :

1) The infectious matter of rabies is transmitted from mother to foetus, but is attenuated in the process. This explains why rabies manifests itself by degrees, following, as it does, the gradual removal of virus from its source.

2) As regards this transmission, there seems to be no difference between different species of animals; it occurs equally in dogs, rabbits, guinea-pigs, and probably in the case of the other animals also.

3) In order to obtain good results from inoculation, guinea-pigs, and not rabbits, must be used, and the injection should be made beneath the meninges. Guinea-pigs being more susceptible to rabies, give more rapid and certain reactions. As rabbits only contract rabies very late and are sometimes immune, their use may lead to erroneous conclusions being drawn.

4) In the case of guinea-pigs it is also very important to prolong the time of observation, since these animals also contract the disease much later than those that are inoculated with virus from the mother.

5) The virus is already circulating in the blood of the animal infected when fever, the first symptom of induced rabies, makes it apparent. By means of the blood it is transmitted from the mother to the foetus some weeks and even months before death.

6) The bite of a dog is already dangerous 14 days before the appearance of the characteristic clinical symptoms.

114. **Treatment of Foot-and-Mouth Disease by means of Hellebore.**—SANTORI LEO in *Il Moderno Zootecno*, Series V, Year V, No. 1, pp. 17-20, Bologna, January 1911.

The root of hellebore is an old empirical remedy which has been completely abandoned by ordinary medical and veterinary practice. The writer, on the other hand, in the course of a long career, has never completely abandoned its use and has lately obtained excellent results in the treatment of the malignant form of foot-and-mouth disease.

Whereas the symptoms of the benign form of this disease are the appearance of large vesicles on the mouth and feet accompanied by a varying amount of fever which ceases directly suppuration sets in, those of the malignant form are minute vesicles on the gums and insignificant lesions of the feet accompanied by very high fever. The cause of the second form is apparently some infective agent still unknown which, gaining access to the organism, acts directly on the blood by attacking the plasma, thus influencing the most important nerve centres.

For the benign form, any treatment based on antiseptic dressing is effective.

In the treatment of the malignant form, the writer has made use of fixation abscesses, that is to say of revulsives provoking the formation of foci of induced inflammation in parts of the body removed from the infected centres; these foci attract the germs and toxins infecting the blood and thus cause the resumption of phagocytosis by the leucocytes. Injections were begun with turpentine, but this treatment is impracticable for

as the strong dose required would be sufficient to impart an odour to the flesh and render it useless should it be necessary to slaughter these suddenly. Recourse was then had to the root of hellebore, the following method being adopted:

Some 10 to 15 roots of hellebore are taken, according to the age and size of the animal, and allowed to macerate in vinegar for 15 minutes. After preliminary disinfection, a longitudinal incision is made in the fetlock, the scalpel penetrating the cellular tissue; the root is then firmly in the wound and allowed to remain for 48 hours. At the end of that time it is withdrawn, the flesh slightly scarified, and the wound washed, disinfected and bandaged. The result of the treatment is to cause the setting of an inflammatory nature extending as far as the neighbourhood of the sternum, with secretion of purulent serum. There should no swelling of the fetlock be observed at the end of 24 to 30 hours; if the case will have a fatal termination; if the reverse be the case, it is certain.

In the course of an outbreak there occurred among 4000 head of cattle, 100 cases of epizootic foot-and-mouth disease, of which 81 were of the malignant type. Of this latter number, 17 succumbed to the apoplectic form, 15 were treated with the usual antiseptics and 51 with roots of hellebore. Except in 2 cases where the disease was too far advanced to give a local reaction, all the remaining 49 animals were cured.

Single Food Diet and Nutritional Deficiency. WILKIE and MOURQUAND, in *Archives des Séances de la Société de Biologie*, Vol. LXXIX, No. 1, pp. 17-18, Paris, January 22, 1910.

It is generally admitted that a diet consisting exclusively of one food or a limited number of foods is the cause of nutritional troubles which culminate in a very serious organic breakdown and even in death. The occurrence of scurvy, beri-beri and certain infantile diseases are explained in this manner.

On the other hand, milk and potatoes (the latter sometimes the sole food of certain portions of the population in Ireland) are two examples of single diets which do not necessarily occasion nutritional troubles.

A series of experiments has shown that:

- 1) Pigeons fed exclusively on whole cereal grains (rice, barley, maize) follow their normal development.
 - 2) Feeding with the same grains completely devoid of husk causes "deficiency" troubles (polyneuritic and cerebellar type) followed by death.
 - 3) An exclusive diet of barley only partially husked ($\frac{1}{4}$ or $\frac{1}{2}$ of husk still remaining) is sufficient to maintain the birds in health.
 - 4) Complete sterilisation of barley grains causes "deficiency" troubles absolutely identical with those occasioned by their decortication.
 - 5) Feeding of cats on an exclusive diet of fresh raw or frozen meat and fish for a long period, whereas the same meat sterilised (at 120°C.) dies (in 25-35 days) nervous derangement followed by death.
- The above facts show that a single food diet becomes harmful only if sterilisation or, in the case of cereal grains, decortication.

A varied diet is undoubtedly more suitable to the organism than consisting of a single food. Feeding pigeons with a mixture of different grains has also been shown by experiment to be more favourable than feeding with a single species of decorticated grain. But if the pigeon be given a mixed ration (wheat, barley, rice) of decorticated cereals, troubles occur, after 14-24 days, symptoms of paralysis followed by death, just as in the case of the ration consisting of decorticated grains of a single species of cereal. So that not only has the variety in the diet been shown to effect normal nutrition but it even seems (judging from the troubles with which troubles appear) to have hastened "deficiency" troubles.

In conclusion, the writers have compared the influence on the nutrition of the rabbit, of a given vegetable ration in the raw and of a sterilised states. In the case of the raw ration the health of the animal was not impaired after 100 days of experiment. In the case of a sterilised ration (1 ½ hours at 120° C.) troubles of a scorbutic type appeared towards the 35th day and resulted in death. Again the variety of the diet was incapable of protecting the animals from "deficiency" troubles.

The decortication and sterilisation of cereals and the sterilisation of meat and vegetable removes from these foods "vital" substances or "vitamins" (vitamines of FUNK) the presence of which in infinitesimal quantities assures the assimilation and utilisation of the ordinary nutritive substances (proteids, carbohydrates, fats).

It is the suppression of these substances by sterilisation or decortication and not the exclusive nature of the diet which, in the preceding experiments, seems to be the primary factor in inducing deficiency troubles and death.

110. — **Formation of Albumen in the Animal Body at the Expense of Nitrogenous and Albuminoid Substances.** — STUTZGER, in *Faklin's Landwirtschaftliche Zeitschrift*, 1918, No. 11-12, pp. 281-295. Stuttgart, 1918.

The syntheses of albumen only occurs in a small degree in the body of domestic animals, as with normal feeding they draw chiefly upon the albumen of the forage.

However, ABDERHALDEN'S experiments have shown that the formation of albumen by synthesis may occur in animals when the necessary constituents are present. The components of albumen may be divided into 2 groups; amino acids of the fat series and amino compounds of the aromatic series. The chief members of the second group are tryptophane and tyrosine.

The formation of amino-acids sometimes takes place in the live animals at the expense of carbohydrates (glycogen) and ammonia. A substance intermediate between the carbohydrate and ammonia on the one hand and the amino-acid on the other is a cetonic acid. Consequently there is only formation of amino-acids belonging to the fat series and the synthesis of albumen is impossible if there are not present in the diet amino compounds of the aromatic series.

The writer makes the following statements based on his own and on various experiments :

1) Carnivora and omnivora are capable of forming albumen synthetically when, in addition to amino-acids of the fat series, there are also present in the body tryptophane and tyrosine.

2) Carnivorous animals are capable of drawing upon a certain quantity of amino compounds and of urea for certain physiological needs. If the food is poor in albumen there is at most a state of nitrogen equilibrium in the body as these nitrogenous compounds protect the albumen of the body against decomposition.

3) Herbivorous non-ruminant animals behave similarly to carnivores and omnivores.

4) Ruminants behave differently on account of the large number of bacteria living in their stomachs and intestines, except in the case of young animals in which the paunch is not yet sufficiently developed.

5) Ruminants which yield no milk may make use not only of certain amino compounds (asparagin), but also of ammoniacal salts (ammonium acetate) by transforming them by the aid of bacteria into a species of albumen known as "bacterial" albumen (Bakterieneiweiss) which is partly utilized by the animals. However, this process takes place only when the fodder is rich in carbohydrates and contains a certain quantity of albumen (not too small). The productive value of this albumen is also much smaller than that of the albumen of the fodder. The asparagin or ammonium acetate which is added to fodder increases the digestibility of the crude cellulose and the nitrogen free extract. Experiments of a similar kind with urea have not yet been made in the case of the above class of animals.

6) On administering fodder sufficiently rich in albumen to ruminants yielding milk, and on adding asparagin to the fodder, effects of two different kinds may be observed :

a) the asparagin does not react :

b) the asparagin stimulates the udder in such a way that the milk yield is greatly increased at the expense of the meat. When a portion of the albumen of the fodder is replaced by amides or by ammonium acetate, the milk yield is always decreased, because the quantity of albumen formed by the bacteria at the expense of these substances is not sufficient to make up for the deficit in the albumen of the fodder. From the scientific point of view, it is interesting to note that ruminants may, in certain cases, make use of the albumen formed by the bacteria for milk production and body maintenance, but from the practical point of view the interest is limited owing to the fact that the economic value is *nil*.

Similar experiments with urea have not yet been made in the case of ruminants giving milk but it may be assumed that this substance behaves in similar manner to ammoniacal salts.

417 - **Experiments with Ammoniacal Salts in the Feeding of Ruminants.** — MORGAN A., in *Deutsche Landwirtschaftliche Presse*, Year 43, No. 19, p. 12, 13, February 23, 1910.

An account of feeding experiments with ammonia salts (especially the acetate) on ewes and goats extending over a period of four years. The animals were first fed a ration containing, on an average, 2.3 to 2.8% of digestible albumen per 1000 kg. of live weight. In 24 cases, part of the albumen was afterwards replaced by acetate of ammonia, and in 12 cases by carbohydrates in the following proportions: 36 per cent of albumen in the first year; 44 per cent the second year; 62 per cent the third and 80 per cent the fourth.

The results of these experiments expressed as percentages of the values obtained with the ration containing the full proportion of albumen are given in the table below.

The results of the experiments may be summarised as follows:

1) Substitution of acetate of ammonia for part of the albumen caused a decrease in the quantity and richness of the milk. The smaller the albumen content of the fodder, the poorer the milk.

2) The substitution by carbohydrates of the same amount of albumen still further reduced the quantity and richness of the milk.

3) Acetate of ammonia had less effect upon the milk yield, than did the albumen content of the forage.

Acetate of ammonia can thus only partially replace albumen. In the digestive tract (especially the paunch) it is transformed by bacteria into albumen which is utilised by the animals. It is considered that acetate of ammonia is capable of replacing part of the albumen, not only in a maintenance ration, but also for production. It must, however, not be used in too large quantities, for fear of ruining the health of the animals. It is better only to use acetate of ammonia in cases where albumen is entirely absent.

Results of Experiments (Values stated as percentages).

	Acetate of ammonia				Carbohydrates			
	No. of animals	Milk produced	Dry Matter of Milk	Fat	No. of animals	Milk Produced	Dry Matter of Milk	Fat
1st year	1	93.7	98.9	—	7	78.0	75.4	74.4
2nd "	9	92.7	91.1	92.5	6	94.1	88.8	88.0
3rd "	9	69.6	67.8	67.2	—	—	—	—
4th "	5	75.1	72.6	72.0	2	63.7	62.4	61.0

418 - **The Heredity of Sex** (1). — *The Journal of Heredity*, Vol. VII, No. 1, pp. 6-11, Washington, D. C., January 1916.

Under ordinary conditions, for every 100 female calves born in a herd of cattle there will be 107 male calves. Many cases have, however, been noticed in which the proportion was very different.

(1) See also *B.*, March 1916, No. 329.

Thus, in a herd of registered dairy cattle, about 75 per cent of all the calves born in recent years have been males, while in another case a cow (which has beaten the world's record for milk production) and its two sisters dropped 12 male calves and only 1 female. The study of the ancestry of these animals revealed, both in the first and second case, an hereditary tendency to produce more offspring of one sex than of the other. The possibility of obtaining by selection a breed of fowls that has a tendency to produce disproportionate numbers of one sex has also been proved. Mr. H. E. SHARP, a breeder of the State of Washington, has developed a strain of Langshan fowls that are producing over 60 per cent females, and this trait is being transmitted from generation to generation; he has also found that amongst the chickens hatched from the eggs of a single fowl, the proportion between the males and females varies very little with the change of the cock with which the hen is mated, or from one year to another, whereas it varies enormously in the case of different fowls of the same lot.

The inbreeding experiment of Dr. HELEN DEAN KING at the Wistar Institute, Philadelphia, has given results which lend some colour to the belief that a strain of animals may be produced having a tendency to produce disproportionate numbers of one sex. The experiment has been carried out for 6 years, and during this time more than 22,000 albino rats have been bred and studied. From the same litter 2 males and 2 females are taken; inbreeding was practised to the 6th generation without any special selection; 2 pairs were taken from this generation, the one (brother and sister) from a litter containing an excess of males, the other from a litter containing an excess of females. There has been steady selection in the opposite direction through 21 generations with strict inbreeding of the animals selected. The result is that, instead of a normal ratio of 100 males to 100 females (which was established at the beginning of the experiment) Dr. King now gets in the one line 150 males to 100 females, and in the other, 65 males to 100 females.

21. — **A New Type of Cattle for Alaska.** — *The Journal of Heredity*, Vol. VII, No. 1, p. 15, 1 fig. Washington, January 1916.

No breeds of dairy or beef cattle have as yet been found hardy enough to stand the winters in the interior of Alaska without excessive expense for food and protection against cold. As a result, milk sells for 50 cents a quart and the beef that is consumed in the country consists almost wholly of cold-storage meat brought from the outside. To remedy this situation as far as possible, the Alaska Experiment Station have undertaken to cross Galloway cattle with the Yak, an Asiatic ox much used by Mongolians, Tibetans etc., for milk and meat as well as work. It is used for a beast of burden at altitudes of 12,000 ft. and more. It is extremely hardy, pastures through the winter under the open sky in Siberia and obtains feed from last year's dead grass dug from under the snow. Crosses of the Yak and ordinary domestic cattle are common in parts of Asia (for example in Turkestan) and have been found of much value.

429. — **Experiments in Germany on the Causes of Sterility in Male Goats.** — Wiesner, in *Deutsche Landwirtschaftliche Wissenschaft* Year 24, No. 52, pp. 451-457, with figures. December 25, 1915.

A detailed study of sterility in male goats. According to the writer, sterility in goats is chiefly due to the male, whereas with sheep the contrary is the case. Sterility in the male goat may be either *partial* and *temporary* or *total* and *permanent*.

I. Partial and temporary sterility is found in the following cases:

1) When the male goat is weakened by disease.

2) When it is badly fed.

3) When a male goat serves too large a number of females; it is generally not sufficient spermatozoa to fertilise them all. This, however, in the writer's opinion, is quite an individual character, since there are examples of quite exceptional sexual potency; thus a good Flemish goat has served 17 females in a single day and 350 in one season, most of which need not need to be put to the male a second time.

4) Onanism is also a cause of sterility.

All the foregoing cases of sterility are curable.

II. — Total and permanent sterility can be induced by various causes of which the following are the principal.

1) *Cryptorchism and hermaphroditism.* — These defects are more observed in the male goat than in the stallion or bull, but the consequences are less serious in the first-named animal. These cases of sterility are transmissible by the parents.

2) *Sterility due to closure of the seminiferous ducts.* — This is the most common form of sterility and causes enormous losses in goat-breeding. Among 25 male goats examined by the writer, 22 had this defect.

The closing of the seminiferous ducts is caused by the induration of the cells of the testicle, epididymis or hilum, generally of all three at once. The induration process usually commences in the testicle, where the spermatozoa, owing to the closing of the seminiferous ducts, form calcified nodules.

Where a portion of the ducts is closed, the fertility of the goat is affected, but if the whole of the ducts gradually becomes closed, the animal becomes completely sterile.

When the duct of the epididymis is entirely closed, the goat is completely sterile, even when large quantities of spermatozoa still remain in the testicle.

Goats with these defects generally retain the desire to cover, but the seminal fluid containing no spermatozoa the female remain sterile. In the early stages of the disease is easily recognisable in its advanced stages, the testicles being small and soft. The hilum is thickened, as is also the epididymis.

In the early stages, on the contrary, this disease is difficult to recognise without examining the seminal fluid.

Attempts to discover the fundamental cause of this defect have led to the conclusion that it is probably hereditary. The sterility of male goats is a trouble met with everywhere but it is less common in some countries. In Germany, most sterile male goats are to be found in Hesse. Of the 25

was examined by the writer, 24 came directly from Hesse, or were the young of parents born in that province.

When purchasing male goats for breeding purposes it is first necessary to ascertain that the genital organs are well formed; animals should not be bought till they are old enough to permit of conclusive examination. If any is difficult to diagnose, recourse must be had to microscopic examination of the seminal fluid.

The article contains numerous illustrations of transverse sections of used testicles.

Experiments in Swine Feeding at the Oregon Agricultural College Experiment Station.—WILTVCOMBE JAMES, POTTER ERMINE L. and SAMSON GEORGE R., in C.

Agricultural College Experiment Station, Bulletin No. 127, 30 pp. Corvallis, Oregon, 1904-1905.

The results of 24 experiments in pig-feeding made at the Agricultural College of the State of Oregon during the last 10 years; the common feeds for Oregon for the fattening of pigs were given to the animals. The following is a summary of the results of some of the most interesting of experiments.

In one of the experiments, 10 high class pigs, 4 $\frac{1}{2}$ months old, from pure-bred Yorkshire sows and sired by a pure-bred Berkshire boar were divided into 2 lots which were as equal as possible. Both lots were fed ground corn while one received skim milk and the other shorts, as a supplement. The total rations fed the 2 lots had the same nutritive ratio and were measured so as also to contain the same amount of nutritive substances. The experiment lasted 62 days. The results are given in the table below, taking into account the expense of rearing and fattening and of the maintenance of the sow during gestation and the keep of the young pigs till the ending of the experiment, the feed cost for the first 100 pounds of live weight was \$4.04. The cost of each further 100 lb. gain was \$6.00 for the lot on shorts and \$4.45 for the lot given skim milk, so that the total cost of each 200 pound pig was \$11.03 in the case of lot I and \$6.84 in the case of lot II.

In another experiment, there were 3 lots of 10 pigs, each of which received the same ration consisting of ground barley 90 per cent and tankage (better house refuse) 10 per cent. Lot 1, hand fed twice daily, ration dry; lot 2, fed with self feeder, ration dry; lot 3, hand fed, twice daily, ration fed twelve hours before being fed. Throughout the experiment the pigs of lot 2 made the most progress and gave the best final result after 67 days of the experiment, as is seen in the table. This lot also consumed the least food per head, while the amount of food necessary to produce 100 lbs of live weight was less in this lot than in the 2 others. The largest increase in live weight per head daily was 2.44 pounds and the smallest was 1.56 pounds; in both cases the pigs were barrows. The 10 best pigs were 7 barrows and 3 gilts (daily increase per head 2.44 pounds -- 1.75 pound). Of the pigs showing the smallest gains in live weight (1.56 pounds -- 1 pound) 6 were barrows and 5 gilts. The 10 pigs that were intermediate between the 2 lots (1.73 -- 1.56 pounds) consisted of 8 gilts and only 2 barrows. The

writers conclude from this that male pigs show a greater variability in live weight than female pigs.

In the last experiment, 2 lots, each of 10 pigs, received a dry ration of 92 per cent of ground barley and 8 per cent tankage and were fed by automatic feeders. The first lot were kept in a covered pen, while the second lot were allowed to feed in a clover field at will. The two lots were uniform in size, sex, breeding and quality of the animals. The experiment lasted 44 days and the results obtained are given in the following table.

Experiment	Lot of pigs	Live weight per head		Consumption of food			Increase in live weight per head daily	To produce 100 lbs. of live weight		
		Initial lbs.	Final lbs.	per head daily				Consumption of food		
				Shorts	Ground wheat	Milk		Shorts	Ground wheat	Milk
I.	1	106	191	1.76	3.5	—	1.21	145	290	—
	2	102	205	—	4.1	7.2	1.54	—	246	149
II.	1	101.0	191.7	6.88			1.48	462.73		
	2	101.4	213.0	7.71			1.82	421.07		
	3	98.5	193.0	6.93			1.84	449.34		
				Barley Tankage Clover.			Barley Tankage Clover.			
III.	1	89	157	5.510	.480	—	1.545	357.524	31.117	377.67
	2	89	173	6.429	.559	<i>ad lib.</i>	1.909	336.784	29.285	366.7

422 - "Clover Flour" as a Feed for Pigs. — ZUR HERST V. A., in *Illustrated Landw. liche Zeitung*, Year 36, No. 3, pp. 13-14, Berlin January 8, 1916.

The "clover flour" sold in Germany for feeding pigs is made by grinding young clover which has been thoroughly dried previously. It is sold with potatoes, beans etc.

In order to determine the food value of this new fodder, a feeding experiment was carried out with 10 sows, upwards of one year old, which farrowed in the spring of 1915. During the summer and autumn of the same year, the animals were turned out to pasture, where they only received a small additional ration of young green clover and afterwards beetroots. On October 28, the sows were put in the sty for fattening. Til the 25th. of the following November, their ration consisted of ensilage, beans, potatoes, fish meal, acorns and beetroots.

Its feeding value corresponded to that established by Kellner. The increase in live weight during this period was 0.44 kg. per head daily.

Calculating the value of the kilo at one shilling, the experiment resulted in a loss of £ 4.7.6 for the lot of 10 animals.

From November 25, the sows were given, instead of the beans, a ration of clover flour (starting with 2 litres, or .44 of a gallon per head at each meal) which was fed mixed with fishmeal and boiled potatoes, with the addition of cold water. This ration was given with some small modifications until December 19, on which day the experiment finished. During the experiment, the animals were always in good health.

During this second period, the live weight of the sows increased considerably, namely 1.38 kg. per head daily. The lot of 10 animals gave a profit just over £14.

Although this estimate does not allow for all possible expenses, it can be said that the productive value of the clover flour had proved excellent.

It is therefore considered that this new food, if fed with fish meal and boiled potatoes, is an excellent feed for fattening purposes.

On the Effects of Feeding Pituitary and Corpus Luteum Substance to Growing Chicks (1). — PEARL, RAYMOND (Biological Laboratory, Maine Agricultural Station). *Proceedings of the National Academy of Sciences*, Vol. 1, No. 1, pp. 50-53. Washington, D.C., January 1916.

These experiments were carried out to determine the effect of pituitary substance on the function of egg production in the domestic fowl. Fifty-five pure-bred Barred Plymouth Rock pullets all hatched the same day were divided into three lots of 15 each. They were chosen so that the total weights of the three lots were equal. Pituitary substance (anterior lobe) contained in gelatine capsules with lactose was given to one lot at the rate of 0.082 gr., per bird per day. A second lot of pullets received the same amount of desiccated corpus luteum substance from pregnant cows and a third lot was kept as a control.

Though all the birds remained in a perfect state of health throughout the experiment, both the corpus luteum and the pituitary substance retarded the growth, the effect being greater in the case of the lot receiving corpus luteum.

There was no evidence that the pituitary substance hastened in any way the initial activity of the ovaries of the pullets.

Thus it appears that both glandular substances retard growth in the fowl without affecting the date of sexual maturity or interfering with normal physiological development.

4 - Two Pheasant Crosses. — PHILLIPS JOHN C. in *The Journal of Heredity*, Vol. VII, No. 1, pp. 12-16, 3 figs. Washington, January, 1916.

In a preceding paper (2) the writer described a reciprocal first cross between Reeves' pheasant and the common ring-neck pheasant (*Phasianus torquatus*). It was shown that the males differed very perceptibly in the two crosses, but of the females nothing could be learned because only the female was reared from the cross of male ring-neck female Reeves', and the same at all in the other cross.

1 See also *B.* January 1915, No. 76; *B.* August 1915, No. 838.

(Ed.).

2 See *B.* February 1914, No. 155.

(Ed.).

In order to find out whether these sterile reciprocal hybrids are transferred in the male sex, and also whether the females would show any differences, another cross was carried out as a check upon the first experiment. But in the second experiment, the Prince of Wales pheasant (*P. principis*) was used instead of the *P. torquatus*.

The *P. principalis* belongs to the dark-necked, red-rumped group. The striking features of the male are briefly as follows: neck-ring absent; lesser and median wing coverts white, with white shaft stripes on greater coverts; rump and upper tail coverts orange red, with a few fine black dots; tail barring reduced to faint lines.

The Reeves' pheasant, *Symaticus reevesii*, belongs to a monotypic genus. The male is entirely unlike any of the true pheasants (*Phasianus*) in coloring, and has a tail 3 or 4 feet long. The upper surface of the body is bright golden-colour, with black edgings to the feathers of the mantle, back and rump, while the breast and flanks are barred with white, black and chestnut. The head is strikingly marked with black and white. The female Reeves' pheasant shows some of the male characters in her tail pattern and the colors of her mantle, breast, and flanks.

The two species crossed are therefore wholly unlike in both sexes in all plumages, and always produce absolutely sterile hybrids. In 1911 Reeves' cock was mated with two Prince of Wales females (Pen J 1914), and a Prince of Wales cock was placed with a couple of Reeves' females (Pen K 1914). Both these parent stocks were inbred and came from the same grandparents.

From Pen J nine birds were reared to maturity, four males and five females, and from Pen K one male and three females. Comparing the features of males and the two pens of females we get the following results.

In the 1914 cross, Reeves' male \times Prince of Wales female (cross *J*), and in the reciprocal cross (*K*) the sterile male hybrids are similar and closely approximate to the slightly different reciprocal hybrids of the Reeves' \times ring-neck experiment of 1912. With the females, however, of the two first mentioned crosses, there are almost no points in common. In cross *J* they are small, female-like, and very close to the Reeves females in their colouring. In cross *K* they are large and male-like, with pattern and coloring of both the male parents. No trace of a sex gland was found in any of these females, but a small and thin-walled oviduct was always present.

It is possible that these facts may be explained on the basis of sex linkage, with the assumption that the eggs are dimorphic, and the sperm monomorphic for sex and sex linked characters, but no proof is available on account of the impossibility of testing the sterile hybrids.

Rough measurements of the spleen cells failed to reveal any difference in their size between *K* and *J* females.

425 - **Laying Competition at Burnley.** — BROWN EDWARD, in *The Journal of the British Poultry Association*, Vol. XXII, No. 7, pp. 658-662, London, October 1915.

For nine years, the Northern Utility Poultry Society, which is largely composed of artisans in a great manufacturing centre, has conducted lay-

competitions. The competition described in this article extended from October 15, 1913, to October 4, 1914.

In no part of the United Kingdom has the keeping of poultry for egg production, as a supplementary pursuit, been developed during recent years to a greater extent than around Burnley. The development has been more or less intensive in its nature owing to local conditions (high cost of land, the fact that all food must be provided, large local demand and high prices paid for eggs), and the average productiveness of the hens is of supreme importance, since without increase of fecundity, the margin of profit would be insufficient.

In view of the desirability of encouraging egg production in industrial areas, the Burnley example is of considerable value, and these laying competitions have exerted a wide influence.

For the purpose of the competition of 1913-14 a small holding of three acres was rented. The competition was arranged in 4 sections:

1) *Small House Section.* — The ordinary small house was used in this section: 12 ft. by 8 ft. and 5 ft. 6 in. high at the eaves, rising to 8 ft. in the centre, with a run allowing 30 sq. yds. for each bird.

2) *Semi-Intensive Section.* — A large flock was located in a house measuring 36 ft. by 15 ft. high at the eaves, rising to 11 ft. in the centre and allowing 3½ sq. ft. of floor space for each bird. Outside was a run divided into four sections for alternate use.

3) *Local Section:* restricted to competitors within a radius of eight miles of Burnley, the houses used being similar to those in No. 1.

4) *Dry Feeding Test:* in which were birds representing 4 noted laying strains.

Each of the small houses used accommodated 234 birds; in Section 2, 50 birds were placed in the large house, grouped into two lots, heavy and light breeds respectively. Each competitor in the open sections was required to enter 8 birds, 4 in the Small House Section and 4 in the Semi-Intensive Section. Comparisons between the two can be made, as the feeding and other conditions were the same, the only differences to be noted being as regards the size of house and the number of inmates.

The following table shows the differences as to average number of eggs laid per hen.

It is evident that the smaller flocks (small houses) yielded a larger number of eggs in winter, though the differences are small in the aggregate. Except in one case, this difference is more apparent with heavy than with light breeds. How far the better results obtained with the small houses make up for the greater cost of equipment and of labour, requires further proof.

The Dry Feeding Test did not prove successful; the 16 birds never presented the same bloom and vigour as the others, especially during the winter. The dry feeding consisted of equal parts of bran, biscuit meal, raps, ground oats and biscuit dust with 10 per cent of fish meal as a dry mash, and of equal parts of wheat, oats, cockle and kibbled maize, or brown barley mixed and given in an automatic feeder.

Average Number of Eggs Laid per Bird Annually in the Small and the Large Houses.

Breed	Number of Pullets	Number of Eggs in Large House	Number of Eggs in Small House
White Wyandottes	48	174.62	172.50
Buff Orpingtons	16	136.75	141.61
Buff Rocks	4	149.25	141.25
Rhode Island Reds	4	181.00	167.75
White Leghorns	68	166.30	169.12
Anconas	16	181.81	172.50
All Breeds	156	167.13	172.50
Heavy Breeds	72	164.65	172.50
Light Breeds	84	169.23	169.12

During the competition, which lasted 1 year, 71 709 eggs were produced; of these 13 526 (or 18.86 per cent) were laid in the winter (October to January inclusive), this percentage being distinctly above the average. The cost of food under such conditions must always be high. In this competition it worked out at 7s. 4d. per bird, per annum. The value of eggs sold per bird was 10s. 3d., and the average price was 1s. 4½ per dozen.

120 - **The Ancestry of the Goose.** - *The Journal of Heredity*, Vol. VII, No. 1, pp. 1-14, figs. Washington, January 1916.

The ordinary breeds of domesticated geese are the slightly modified descendants of the grey lag goose (*Anser anser* L.) which is still found throughout northern Asia, although nearly extinct in Europe. It has already been domesticated at the most remote period of civilisation. That appears to be in *Anser anser* and its tame descendants, as well as in the Chinese species (*Cygnopsis cygnoides*), a strong tendency to the production of white mutants and from these the white variety of both species has been created. As a rule, the changes due to domestication (waddling and lessened ability to fly and deeper rump) are those that would naturally be produced by selection of specimens possessing the best marketable form.

The American Standard of Perfection recognises the following breeds of geese: Toulouse (gray), Embden (white), African (gray), Chinese (dark brown and white varieties), Wild or Canadian (gray) and Egyptian (coloured). Of these, the "Toulouse" seems to have been produced in France; its plumage much resembles that of *A. anser* but the colour pattern is simpler. The Embden has been obtained by North German breeders and around Westphalia by selecting white "sports" and breeding them.

The history of the "African" breed is somewhat uncertain. It is probably a cross between the Chinese goose, the Toulouse breed and some of the Embden. The fleshy protuberance on the beak is characteristic of domesticated forms of the Chinese species, also the black stripe on the back of the neck, while the plumage resembles to some extent that of the Toulouse goose. The 3 above-mentioned breeds are heavy weight or market varieties, weighing from 17 to 25 lb. when properly fattened.

The Egyptian breed comes from an entirely different species (*Chen aegyptiacus*) which has been of much importance to the domestic economy of Egypt ever since the beginning of history.

The Canadian goose is the domesticated wild goose of North America (*Canadensis*). It is easily tamed, but has little commercial importance as a domesticated breed. The Chinese goose (*Cygnus cygnoides*) is well and furnished a good quality of meat; it is the largest of all wild geese and weighs from 10 to 14 lb. It is yearly becoming more popular in the United States and deserves to be widely kept. All these species can be interbred freely in captivity.

Parthenogenesis in the Silkworm. — LÉCARTON A. in *Congrès Rendes-lebel-matériaux*, Séances de l'Académie des Sciences, Vol. 162, No. 6, pp. 234-236. Paris, February 16, 1915.

Observations made in June 1914 and June 1915 (with moths of the *exulans* breed) with a view to solving the vexed question of the parthenogenesis of *Bombyx mori*. The following conclusions were drawn:

1) Oviposition in the case of females that cannot mate becomes cyrtotegular.

2) A certain number of unfertilised eggs can undergo changes in form similar to those shown by fertilised eggs which develop normally. This is in agreement with previous observations.

3) Shaking unfertilised eggs is incapable of increasing the number or change their colour. In this experiment the eggs were placed in cardboard boxes immediately after they were laid and shaken vigorously for minutes and again several times during the next 3 days.

4) The action of sulphuric acid (diluted in an equal volume of water and allowed to act for 5 minutes on unfertilised eggs) is also negative.

5) It seems logical to conclude, as all previous workers have done, that the changes of colour undergone by certain eggs are a proof that parthenogenesis occurs in the case of the silkworm; only a cytological study, however, is capable of deciding the question definitely.

Food of the Rainbow Trout (*Salmo irideus* Gibb.) in Alpine Lakes. — KAISER, ALFRED L. and FRELMANN J. W., in *Schweizerische Fischerei-Zeitung*, Year 23, No. 12, pp. 320-325. Pfäfers (Zürich), December 1915.

A preliminary account of observations made early in October 1915 at the Hydrobiological Station at Davos (Switzerland). (1).

The fish under observation were 5 months old and were derived from the hatchery at Heuweise, near Buchs. The plankton of Lake Lugano, which forms the food of the larvae is chiefly composed of species of *Infusoria*, *Cyclops* and a Centropogid *Diaptomus denticornis* Wierz. The latter, which is red in colour owing to its carotin content, forms practically the entire food of the rainbow trout. Not only are the stomachs of the fry completely crammed with specimens of this crustacean but their eyes are coloured a vivid red by the carotin.

This is all the more curious in view of the fact that *Daphnia* forms a much greater proportion of the plankton of the lake than *Diaptomus*, being sluggish in its movements, is much more easily caught than *Diaptomus* which is a good swimmer and very active. Parallel experiments on the fry of the common trout (*Trutta fario*) have shown that this latter is more catholic in its tastes.

This observation is regarded as being of considerable importance as it throws light upon some common, but hitherto obscure, phenomena. It also confirms the results of several other authors. DR. G. SUMMERER, in an article on the stocking of alpine lakes with rainbow trout has already suggested that the red colour of the trout in lake Sul is due to the presence of large numbers of *Diaptomus*. Unfortunately, he omits to give the exact name of the species, which might possibly be *D. bacillifer* Koelbel as the latter also shows the characteristic red colour. At the same time it may be assumed that *D. denticornis* was the species concerned, as *D. bacillifer* lives chiefly at altitudes ranging from 7900 to 8000 feet and, according to ZSCHOKKE, has only been found three times at a lower altitude than 5000 feet, whereas lake Sul is only 6,320 feet above sea level. Further the two species never occur together. More recently, LÄGER has concluded, from his experiments on the stocking of alpine lakes that, contrary to the prevailing opinion, the rainbow trout is the best species for this purpose.

In view of the fact that the rainbow trout of Lake Davos possess the same red flesh as those of Lake Sul and that *Diaptomus denticornis* forms practically the entire food, not only of the fry, but probably of the adult fish also, it may be concluded that the red coloration of the flesh of the rainbow trout in the alpine lakes is derived from *Diaptomus denticornis*.

We thus have the reason why the rainbow trout, contrary to expectation, does not leave Lake Davos, notwithstanding the fact that this latter has an outlet and the flow of the water is favourable. It is because the fish find food to their taste such as does not occur, for instance, in the lakes of the plain, in spite of their richness in insects, larvae, small fish, &c. This theory is confirmed by the fact that the rainbow trout does not usually leave the lakes of the plain as a one or two year old fish, but only at maturity or thereabouts, as if it were then anxious to find a spot which would ensure a suitable food supply for the larvae.

The point of practical value in connection with these observations is that henceforward it will be possible to determine immediately whether or not an alpine lake is suitable for stocking with the larvae of *Salmo trutta*.

Where the plankton is shown to contain *Diaptomus denticornis* this species will succeed well.

The red colour of *Diaptomus* cannot be the reason for the larvae preferring this species to the exclusion of all others but less obvious factors must be concerned, either of a purely mechanical or possibly of a biochemical nature. Undoubtedly, *Diaptomus* should be the cause of much more rapid growth on the part of the fish as, owing to their preference for this species, they eat considerably more than they would otherwise do.

Cyclops and *Daphnia* are thus only eaten by young rainbow trout when there is nothing better to be had. If, however, the fish make such a selection from among the living plankton, it is obvious how little need must be made by such substitutes as pieces of spleen, brain, liver, yolk meal etc. The degeneration observed in the fish of the waters of the plain is possibly due to the unsuitable diet in their early stages. In Lake Lucerne this degeneration has not been observed. It follows from this that hatcheries which can feed their larvae with *Diaptomus denticornis* produce the healthiest and quickest growing fish. Breeding of *Salmo trutta* should therefore only be carried out in the alpine lakes and not in the plain. This method should enable breeding trout from alpine lakes to be substituted for those imported from their native waters, often at considerable expense, in order to reinvigorate the population of the waters of the plain.

FARM ENGINEERING.

100. **Chaff-cutter with Curved Blade and Plate for Packing the Straw** *Illustr. d. Landw. mechan. Zeitsung*, 3rd. Year, No 10, pp. 91-94, 5 figs. Berlin, Feb. 1, 1910.

The chaff-cutter patented by the firm of Heinrich Schrammeyer of Haldensleben, near Osnabrück, Germany, (German patent No 289,461) differs from others already in use, through the fact that the plate for compressing or packing the straw forms part of the feeding tube, being joined to the lower portion of this latter and pressing the straw against the side opposite, nearest to the blade. By means of this arrangement, the sheaves are well chaffed without having been previously opened out, *i. e.* just as they come in from the field.

The chaff-cutters employed hitherto have the following drawback: when cutting is begun, the sheaves being tied round the middle their ends only partially fill the orifice of the feeding tube, and they are consequently pressed unevenly in the plane of the blade. This latter does not meet with the resistance necessary for clean cutting and as a result a portion of the straw is crushed and torn instead of being properly cut.

To overcome this difficulty, in the new chaff-cutter the packing plate is arranged in such a way that directly the blade begins to act the plate presses the straw against the opposite side of the feeding tube and ensures a clean cut.

Fig. 1 shows the machine in side view and fig. 2 in front view. Figs. 3 and 4 show the method of working of the packing plate and of the chaff-cutting blade.

Chaff-cutter with Curved Blade and Plate for Packing the Straw

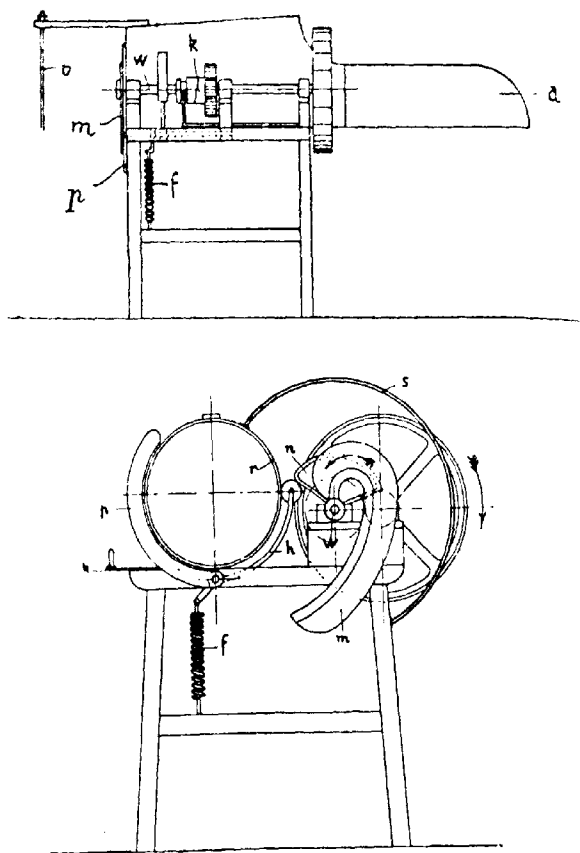


Fig. 1. — Machine in side view.

Fig. 2. — Machine in front view.

in fig. 3 the straw, still in its loose condition, does not completely fill the interior of the feeding tube and neither plate nor blade have yet begun to

in fig. 4 the packing plate has pressed the end of the sheaf against the opposite wall and the blade has begun to act.

Examination of the figures shows that (fig. 1) the curved plate *a* on which the sheaf is placed is followed by a cylindrical tube *r*, into which the straw is fed until stopped by a plate *b* adjustable according to the length of cut required. A curved plate *p* (figs. 2-3-4) is hinged to the lower part

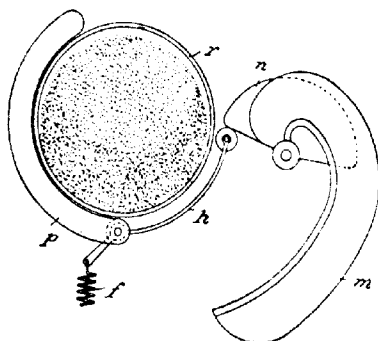


Fig. 3

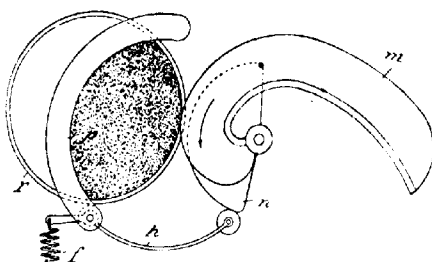


Fig. 4

Fig. 3 and 4. — Mode of action of blade and packer.

of the feeding tube and is maintained in the open position by means of a co-spring *f*. A curved arm *h* is connected with the plate *p* and through the agency of a roller presses against the cam *n* mounted on the shaft to the blade *m*. This latter, revolving in the direction of the arrow, grasps the plate *p* in scissor fashion; the knife is worked by a gear driven off the roller. The bush *k* (fig. 1) enables it to be thrown in and out of gear at will. The blade is protected by a guard *s*.

2. — **Apparatus for the Cheese Curing Room.** — *Schweizerische Milchzeitung*, Year 42, No. 14, p. 3, Schaffhausen, February 18, 1916.

Hitherto all the work of salting and cleaning cheeses in curing or store rooms required a good deal of labour, as every cheese had to be removed

from the shelves, carried to a table to be treated and then put back in its place, all by hand. When large and heavy cheeses have to be taken two or three times a week the work becomes especially fatiguing, as the cheeses on the upper shelves are often 10 or 12 feet from the ground.

M. DAVID LÖRTSCHER of St Gallen, the inventor of the cheese moving apparatus "Merkur" at present in general use, has devoted some years



Apparatus "Mars" for the manipulation of heavy cheeses.

to the study of the problem and has now invented the portable cheese moving table "Mars" worked by hand or power, which effectively saves a very amount of labour in the curing or store room.

The apparatus, shown in the accompanying figure, consists of a kind of lift mounted in a frame on rollers, so as to be easily moved in the passage

between the rows of shelves. The lift platform is suspended by two strong wire ropes between two uprights.

Part of the platform is occupied by a cleverly constructed salting table provided with a device for turning the cheese over, leaving sufficient space for the workman. A 1½ HP. electric motor is sufficient to propel the whole apparatus forwards and backwards, or to raise close up to the top shelves or lower to the ground the platform and salting table together with the cheese and three heavy cheeses. The lift is fitted with automatic stops. The salting table and the platform are provided with rollers covered with rubber and worked by electricity.

When the table has been lifted to the proper height the rubber roller on the table is placed under the part of the cheese projecting beyond the edge. The roller is set in motion and draws the cheese into the table where it is extracted. By a simple device the heaviest cheeses are turned over without exertion on the part of the operator, and by reversing the motion of the roller the cheese is returned to its place on the shelf. For the lower shelves the table is removed, the platform itself acting as table, being provided with the necessary rollers and turning device.

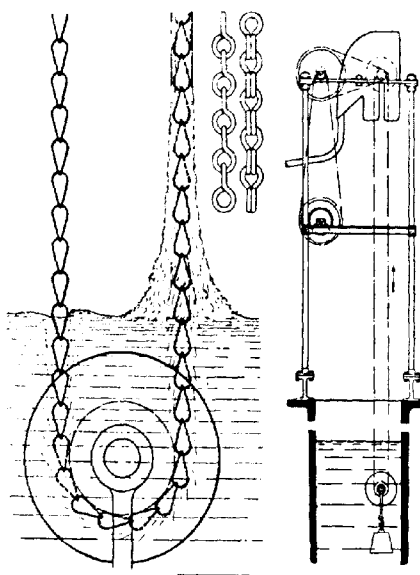
As electric power is not everywhere available this apparatus is also constructed for hand power. It is built in different sizes to suit any height or width of passage.

Chain Pump or Conveyor. — *The Practical Engineer*, Vol. 53, No. 1807, p. 20, London, January 13, 1916.

A number of chain pumps have already been devised, some consisting essentially of tubing fitted with piston disks, the chain merely connecting the disks, others of series of little buckets, and others again of a compound endless chain — carrying the liquid by capillarity and adhesion — which is moved by a central chain surrounded by two metal wire helical springs. Messrs J. C. GRANT and A. JARVIS have now found by experiment that water either alone or carrying solids in solution or suspension can be very efficiently lifted by a simple bare chain, though the quantity varies considerably with the pattern and size of the chain. The form of chain found most suitable is the double jack chain, of which a few links are shown in the accompanying illustration, each link having a single and a double loop in planes at right angles to each other.

The example illustrated is for raising water from a well. A small pulley having a V groove is mounted on a shaft supported on a framework above the well and driven by a hand wheel. Over the pulley passes an endless chain long enough to descend beneath the level of the water in the well and passing round a submerged weighted pulley, also V grooved. The upper pulley is mounted in a casing with a chute into which the water is discharged. On rotating the chain rapidly, the rising run lifts the water which forms a cone shaped mass at the surface and gradually assumes a cylindrical form round the chain. The upper pulley must be of small diameter to give a sudden change and direction to the chain and throw off the water. The submerged pulley may be of ample diameter. Sand and water even

in the proportion of 6 lbs. to a gallon can be readily lifted by the system, which has been patented.



Chain for conveying water.

432 - Review of Patents.

Tilling machines and implements

Denmark	29 842. Device for motor ploughs.
Italy	150 283. Motor plough. 150 689. Improvements in the winding drums used for motor ploughing. 150 851. Harrow.
Spain	60 943. Plough beam. 61 155. Plough with twin bodies and only one mouldboard. 61 185. Improvements in disk harrows.
Sweden	39 624. Device for cultivators.
Switzerland	71 778. Garden implement.
United States	1 104 774. Stalk cutter. 1 104 792 — 1 166 144. Cultivator attachment. 1 165 097 — 1 168 135. Motor plough. 1 165 213 — 1 165 857. Harrows. 1 165 267. Reversible disk plough and cultivator.

- 1 165 297. Ditching plough.
- 1 165 527. Harrow attachment for gang ploughs.
- 1 165 808 — 1 166 169 — 1 166 207 — 1 167 083. Ploughs.
- 1 166 135 — 1 166 446 — 1 167 122. Cultivators.
- 1 166 195. Cotton chopper and cultivator.
- 1 167 420. Motor plough and cultivator.
- 1 167 645. Weed cutter and pulverizing machine.
- 1 167 969. Combined drag and harrow.
- 1 168 158. Combined lister and fertilizer distributor.
- 1 168 201 — 1 168 202. Wheel cultivators.
- 1 168 208. Wheeled plough.

Manure distributors.

- 1 165 030. Rake fertilizer distributor.
- 1 165 490. Fertilizer distributor.
- 1 166 632. Straw spreading attachment for manure spreader.
- 1 165 642. Manure loader.

Drills and sowing machines.

- 1 166 864. Drill.
- 1 166 563. Share for drills.
- 1 167 756. Potato planting and manure distributing machine.
- 1 166 477 — 1 167 814. Seed and fertilizer distributor.
- 1 166 502 — 1 166 962. Planters.
- 1 167 438. Check-row corn planter.
- 1 167 545. Drill attachment.
- 1 167 551. Disk grain drill.
- 1 167 662. Seed feeding apparatus for cultivators with disks and elastic teeth.
- 1 167 907. Potato planting attachment.

Reapers, mowers, and other harvesting machines.

- 1 164 793. Canvas conveyor for binders.
- 1 164 821. Horse rake and stacker.
- 1 164 848. Reaper.
- 1 164 877. Sheaf carrier for reapers.
- 1 164 666. Device for lifting the cutter-bar of mowers and throwing them into and out of gear.
- 1 164 776. Apparatus for sharpening scythes.
- 1 164 767. Sheaf binding harvesters.
- 1 164 691. Cutter bar for harvesting machines.
- 1 164 713. Mowing machines.
- 1 165 169. Guard means for the cutting mechanism of binders, mowers etc.
- 1 165 319 — 1 165 650 — 1 166 329. Grain shocking machine.
- 1 165 758. Corn harvester.
- 1 166 136. Side-delivery rake.
- 1 166 594. Hay unloader.
- 1 166 963. Attachment for hay rakes.
- 1 167 213. Seed harvesting attachment for mowing machines.
- 1 167 651. Hay loader.
- 1 167 739. Grain loading machine.
- 1 167 911. Grain carrier for harvesters.

Machines for lifting root crops.

- United States 1 166 083. Machine for topping beets.
1 166 762. Beet harvesting machine.

Threshing and winnowing machines.

- Spain 66 887. New threshing machine.
61 614. Machine for winnowing and grading all kinds of grain.
61 269. Elevator ribble adaptable to any system of threshing.
61 270. Improvements in threshing machines.
United States 1 165 241. Threshing machine, maize sheller or like machine.
1 165 786. Threshing machine.
1 166 617. Corn husking machine.
1 166 739. Pea and bean thresher.

Machines and implements for the preparation and storage of grain, fodder, &c.

- Spain 69 877. Frames for baling hay, straw cotton, cork etc.
Switzerland 71 913. Electrostatic groats cleaning machine.
United States 1 164 922. Baling press.
1 167 858. Alfalfa meal grinder.
1 167 871. Ensilage protector.

Dairying machines and implements.

- Denmark 20 813. Pulsator for milking machines.
20 849. Milking machine.
20 855. Drum for separators.
Netherlands 1 953. Implement for treating milk for the preparation of cheese.
United Kingdom 20 417. Cow milkers.

Other agricultural machines and implements.

- Denmark 20 829. Peat kneading machine.
British India 2 186. Improved methods of separating fibres from seeds and applying them thereto.
Italy 150 211. Pincers for marking live stock.
150 819. New sprayer for insecticides and anti-mildew liquids.
Spain 60 945. Filtering plates for beetroot filtering presses.
60 975. Machine for cutting cork slabs into sheets.
61 010. Boring machine for discovering water at small and constant depth.
61 084. Improvement in machines for sharpening the knives of machines for cutting cork disks.
61 267. Apparatus for the carriage of bananas.
Sweden 39 438. Overhead carrier for stables.
Switzerland 71 877. Device for tying up vine canes.
71 878. Device for nuying live stock in stables.
United States 1 165 481. Steering device for tractors.
1 165 708 — 1 166 246. Tractors.
1 165 930. Motor driven tractor.
1 167 302. Traction engine.

Small Circular Reservoirs in Reinforced Cement. — PARIS, RAFFAELE, in *Giornale di Architettura della Domenica*, LVXIIth Year, No. 1, p. 68, 3 figs. Piacenza, Feb. 27, 1917.
 The system proposed by the writer consists essentially in the construction of 2 walls of reinforced cement which form the sides of the embankment. These latter are connected transversely and thus ensure stability

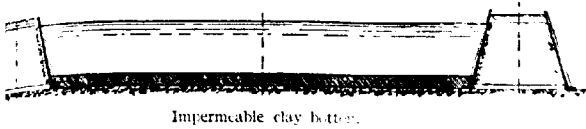


Fig. 1. — Vertical section through reservoir.

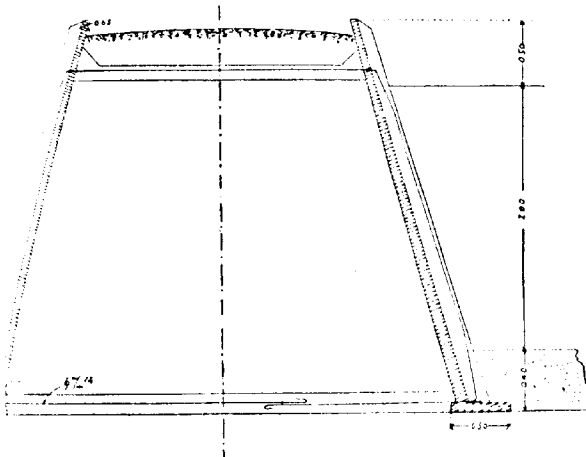


Fig. 2. — Vertical section of earth-filled embankment.

about the necessity for constructing the ordinary embankments which are so much more costly.

By means of this system, the weight of earth necessary to oppose a great volume of water may be reduced to a minimum; the walls of reinforced cement render the sides impermeable. By covering the bottom with a layer of clay this latter is also rendered waterproof and the heavy expenses in connection with foundations are divided. As shown in Fig. 2, the walls are formed of cement tiles which may be reinforced with a network of metal. The tiles are strengthened at the cross joints by means of ribs; their length is thus limited to the distance between the said joints.

The expenses necessary for a plant sufficiently large to irrigate 61.8

acres supplying 5716 cubic feet of water per acre every 10 days are supplied at a little less than £400. Of this sum nearly £80 is required for a motor pump, estimating a difference in level of 82 feet and a flow of 12 gallons per second, and £278 for the construction of a reservoir of 175,000 cubic feet capacity (1).

434 - **Effect of Temperature on the Strength of Concrete.** — *Engineering*, No. 2614, p. 109, London, February 4, 1916.

Much uncertainty still exists as to the time required before the concrete can be removed from reinforced and other concrete works, and loaded safely with safety.

With a view to contributing to the solution of the problem, Mr. A. J. MAC DANIEL has made some interesting experiments at the Engineering Experiment Station of the University of Illinois in order to test the effect of temperature on the rate of increase in strength in concrete.

For this purpose over 150 cubes and cylinders of concrete were made and stored at mean temperatures ranging from 26.5° to 90.6° Fahrenheit, and tested after intervals of from 3 to 28 days. The concrete used was a 1 part by weight "Universal" Portland cement with 2 parts sand and 4 parts crushed limestone, corresponding to 1 : 2.2 : 3.6 by volume.

The moulds were 6 inch cubes or cylinders 6 in. in diameter and 6 in. long or 8 in. in diameter and 16 in. long.

Some of the specimens were moulded at the temperature at which they were to be stored, most of them, however, were moulded in the laboratory and taken to the storage rooms after setting for 6 hours. In all cases they were kept moist. The figures obtained for the cubes were multiplied by 0.73 to make them comparable with the data obtained for the long cylinders.

At low temperatures the strength was found to increase slowly, provided the specimens were not alternately frozen and thawed, as this caused disintegration. At ordinary and comparatively high temperatures, higher crushing stresses were reached in a given time and generally the stress seems to increase with the storage temperature.

The average stresses obtained with specimens stored at a mean temperature of 48.5° F. were 800 lb., 1130 lb. and 1410 lb. per square in. respectively after 7, 14 and 28 days, while for a set stored at 72.8° F. the figures were 1210 and 1530 lb. per sq. in. for the same periods.

As a result of these experiments Mr Mac Daniel concludes that for concrete hardening at from 60 to 70° F. the ratios of strength at 7, 14 and 28 days to the strength at 28 days may be taken as about 0.5, 0.75 and 1.0 respectively. The ratios are higher for high temperatures and lower at low temperatures. The actual strength of concrete after 1 week at a temperature of 60 to 70° F. would be practically double that of the same material kept at from 32 to 40° F.

(1) See also R. CAPPELLI and A. BRUTTINI. I serbatoi Cappelli in *Bollettino della Società degli Agricoltori Italiani*, XVth Year, No. 2, Rome, January 31, 1915.

RURAL ECONOMICS.

A diagram accompanying the article gives, with a fair degree of approximation, the strength attained by concrete kept at temperatures between 5 and 60° F. for periods ranging from 3 to 28 days.

Extensive Use of Silos in Kansas, U. S. A. — NICHOLS, J. B., in *The Country Gentleman*, Vol. LXXXI, No. 3, p. 108, Philadelphia, Jan. 15, 1916.

There are now more than 10 000 silos in the State of Kansas; in 1900 there were only 100. The leading silo counties are in the most prosperous portions. For example, Sedgwick, an especially rich county, has the lead in silo building. Reno comes next with 333 while Lyon and Sumner have 250 each. The greatest percentages of increase are found in the western counties. For example, the gain in Meade County in 1914 was 600 per cent; Barton 336; Rooks 244; Clark 210; Pratt 144; and Ford 142 per cent. This rapid increase is due largely to the activity of the State Experiment Station, which has demonstrated that silage from sorghum and kafir corn has a high a feeding value as that from maize. For instance, the average yield of Kansas orange sorghum at the Station farm at Manhattan in the last two years has been 18 tons an acre. Fields of 12 to 15 tons an acre of sorghum and kafir corn in the eastern part of the State are common; in almost all cases these yields are much larger than those of corn. The average yield decreases as one goes westward, but good yields of silage are obtained from the sorghum most years as far west as the Colorado line.

An even greater increase in silo building is expected in the future.

RURAL ECONOMICS.

Cash-renting and Share-renting in Missouri, United States. — JOHNSON, O. R., in *The Country Gentleman*, Vol. LXXXI, p. 18, Philadelphia, January 1, 1916.

In a farm management survey made in North-western Missouri, figures gathered on the 660 farms showed that the average share tenant made 87.8 greater net income than the cash tenant, and that a share of the crop paid the landowner 1.3 per cent higher interest on his investment than was received by the owner who rented for cash.

The following averages were obtained:

- a) the total net income of the average tenant who rented all his land on a share basis was \$ 548, the owner receiving 1.9 per cent;
- b) the average cash renter made \$ 410 and paid a rental that returned 1.50 per cent to the owner;
- c) the tenant who rented his crop land for a share and his grassland for cash made a net income of \$ 507; the owner received 5.9 per cent on his investment.

Labor Income in Minnesota, United States. — *The Country Gentleman*, Vol. LXXXI, No. 1, p. 18, Philadelphia, January 1, 1916.

In Rice Country, Minnesota, records were taken from 400 farms in order to determine the relation between the number of units of labor on a farm and the labor income

A unit of labor consists of ten hours of man labor or twenty hours of horse labor.

Labor income is the amount earned by a farmer in excess of the value of the farm produce used by his household, and of farm expenses, and interest on the investment at five per cent.

Dividing the 400 farms into groups according to the number of units of labor, we have: for the first group of farms with less than 400 units of labor, a labor income of \$ 97; for the second group of farms with 401 to 600 units of labor, a labor income of \$ 267; for the third group of farms with more than 1,000 units of labor, a labor income of \$ 633.

The efficiency of man labor is even more important than the amount of time expended.

The labor income gradually increased from \$ 5, where the hours of each man for a year were 1500 or less, to \$ 633, where the hours of each man were more than 3500 each year.

The above results indicates that a farm business of more than average size gives opportunity for high efficiency of man and horse labor. A farm business of more than average size coupled with high labor efficiency brings profits in farming.

138 - **Advantage of Diversity in Farming Operations in the Central Wheat Belt Kansas, U. S. A.** - JOHNSON, E. C., in *The Breeder's Gazette*, Vol. LXVIII, No. 2, 1916, Chicago, December 30, 1916.

At the initiative of the Harvey Co., Kans., Farm Bureau, surveys were made on 70 farms in Macon township, a typical wheat section of the country, by P. E. McNall and County Agent F. P. Lane, in order to determine the influence of the high price of wheat on the farmers' labor income, and to ascertain whether the high prices quoted in the Chicago market (\$ 1.65 a bushel in Feb. 1915) were due to the farmers' holding off wheat to secure extortionate prices.

Regarding the second item, the survey has shown that in September, 1914, 82 per cent of the wheat crop had already been sold at the average price of 90 cents per bushel, that is 12 cents more per bushel than the average received for wheat in this section for the last 10 years, not including 1914. This, together with the exceptionally large yield of 26.2 bushels per acre, as compared with an average yield for Harvey county for the 10 years of 15 bushels per acre, made it possible for the wheat farmer to realize a high labor income for 1914.

The average farmer in the community made a labor income of \$ 125 and, in addition, realized 5 per cent interest on a capital of \$ 22,731. These farmers, however, had produced a yield of only 15 bushels per acre and had received 78 cents per bushel, which were the average yield and price for this area for the last 10 years, their labor income would have been only \$ 451 per farm.

The income of the 15 better-paying farms amounted to 5 per cent interest on an investment of \$ 28,602 and, in addition, a labor income of \$ 3117 per year; these farms growing an average of 138.2 acres of wheat with an average yield of 26.2 bushels per acre.

On 11 of the better-paying farms, however, receipts from cattle averaged \$307, on 8 of the farms receipts from swine \$1007, and on 7 farms receipts amounted to \$514, so that all this income must not be added to wheat.

In fact, the 15 better-paying farms had 3.7 enterprises per farm which averaged over \$ 200 per enterprise, while the average farm in the section had only 2.7 enterprises which returned over \$ 200 per enterprise. This is a strong argument for diversity in the farming operations, even during years of unusual yield of wheat and when the price is above the average.

Cultivation of the Bamboo as a Profitable Commercial Enterprise. GERARD G.

in *Raffino della Società Orticola Varesina*, Year III, No. 28, pp. 5-8; No. 29, pp. 5-8; No. 30, pp. 5-8; No. 31, pp. 5-8. Varese, January 1916.

Data from experiments made by, or under the control of, planters in Japan. The same data are confirmed in Japanese publications dealing with the bamboo as a plant of economic importance.

The following is an account of the average expenses and receipts for a plantation of 1000 plants, occupying an area of practically 1 acre; the seed covered is 10 years and no account is taken of interest:

$$J^{\pm} \in \mathcal{L}_2(\mathcal{H}_1, \mathcal{H}_2)$$

Paying of plot of ordinary land, about 1 acre, 1000000	Yen 1000000
1000 bamboo plants of various types, 1000000	30 14 50
Trans-plantation and manuring 1000000	10 16 00
Various unforeseen expenses 1000000	10 16 00
Taxes, 10 years 1000000	1 16 00
Harvesting the stems of the 4th and 10th years' growth 1000000	30 15 00
Total expenses	115 16 00

Receipts.

1000 stems in	1st year, at 6s. 3d. per 100	1000 stems in	2nd year, at 6s. 3d. per 100	1000 stems in	3rd year, at 6s. 3d. per 100	1000 stems in	4th year, at 6s. 3d. per 100	1000 stems in	5th "	1000 stems in	6th "	1000 stems in	7th "	1000 stems in	8th "	1000 stems in	9th "	1000 stems in	10th "	1000 stems in	11th "	1000 stems in	12th "	1000 stems in	13th "	1000 stems in	14th "	1000 stems in	15th "	1000 stems in	16th "	1000 stems in	17th "	1000 stems in	18th "	1000 stems in	19th "	1000 stems in	20th "	1000 stems in	21st "	1000 stems in	22nd "	1000 stems in	23rd "	1000 stems in	24th "	1000 stems in	25th "	1000 stems in	26th "	1000 stems in	27th "	1000 stems in	28th "	1000 stems in	29th "	1000 stems in	30th "	1000 stems in	31st "	1000 stems in	32nd "	1000 stems in	33rd "	1000 stems in	34th "	1000 stems in	35th "	1000 stems in	36th "	1000 stems in	37th "	1000 stems in	38th "	1000 stems in	39th "	1000 stems in	40th "	1000 stems in	41st "	1000 stems in	42nd "	1000 stems in	43rd "	1000 stems in	44th "	1000 stems in	45th "	1000 stems in	46th "	1000 stems in	47th "	1000 stems in	48th "	1000 stems in	49th "	1000 stems in	50th "	1000 stems in	51st "	1000 stems in	52nd "	1000 stems in	53rd "	1000 stems in	54th "	1000 stems in	55th "	1000 stems in	56th "	1000 stems in	57th "	1000 stems in	58th "	1000 stems in	59th "	1000 stems in	60th "	1000 stems in	61st "	1000 stems in	62nd "	1000 stems in	63rd "	1000 stems in	64th "	1000 stems in	65th "	1000 stems in	66th "	1000 stems in	67th "	1000 stems in	68th "	1000 stems in	69th "	1000 stems in	70th "	1000 stems in	71st "	1000 stems in	72nd "	1000 stems in	73rd "	1000 stems in	74th "	1000 stems in	75th "	1000 stems in	76th "	1000 stems in	77th "	1000 stems in	78th "	1000 stems in	79th "	1000 stems in	80th "	1000 stems in	81st "	1000 stems in	82nd "	1000 stems in	83rd "	1000 stems in	84th "	1000 stems in	85th "	1000 stems in	86th "	1000 stems in	87th "	1000 stems in	88th "	1000 stems in	89th "	1000 stems in	90th "	1000 stems in	91st "	1000 stems in	92nd "	1000 stems in	93rd "	1000 stems in	94th "	1000 stems in	95th "	1000 stems in	96th "	1000 stems in	97th "	1000 stems in	98th "	1000 stems in	99th "	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems in	1000 stems 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: The minimum price paid to growers is really 7s 11d. per 100.

The bamboo stems sold by the big grower should be some 10 feet, picked stems averaging $19\frac{1}{2}$ to $29\frac{1}{2}$ feet in length. There then remain the tops for which there is considerable demand among horticultural and basket manufacturers who are prepared to pay them 1s. 7d. per 100, according to the diameter. Including this secondary product, therefore, a plantation may be said to produce, between the 4th and 5th year, nearly £1000 worth of stems.

According to the price lists of the chief French firms exporting bamboo stems the average retail prices for canes of various lengths are as follows:

Length metres	Width millimetres	Price per 100 £ s. d.
0.60	6	1. 5
0.70	6.5	1. 7
1.10	6.5	2. 6
1.20	8-10	2. 9
1.30	10-12	3. 6
1.50	12-15	69. 6
1.50	18-22	17. 5
2.00	12-15	11. 1
2.00	18-22	19. 16
3.50	35-55	3. 10. 4

On the basis of these prices, the writer calculates that in the estimation of the value of the bamboos produced by a plantation the standard price of 6s. 4d. per 100 only represents $\frac{1}{100}$ th of the real value for the home trade seeing that what are considered as picked stems by this latter are at least 30 to 40 mms. in diameter ($1\frac{1}{5}$ to $1\frac{3}{5}$ inches). This is additional evidence in favour of the cultivation of this crop in uncultivated land whether of plain, hill or mountain.

440 - **Cost of Running a Peach Orchard in North Carolina, U. S. A.** — PAGE, A. W. *The Country Gentleman*, Vol. LXXX, No. 47, pp. 1750 and 1772. Philadelphia, N. Y. 1915.

The farmers of Moore County, North Carolina, have established an organisation, known as the Sandhill Board of Trade, the chief object of which is to ascertain exact facts and conditions, and profits and losses on all the farms and crops in the territory. The carefully tabulated information gained by this society is of real and practical value to the whole county.

The present writer takes as an example the case of peach growing, such as it appears from an examination of the books of the Carolina Fruit Company, a little ninety-acre orchard which may be regarded as typical. It was planted in 1907 on land cleared of scrub oak and pine stumps.

receipts and expenses of the Company, from its beginning until Sept. 1, 1910, when the first small crop of peaches was sold, were as follows:

TABLE I. — *Statement for the Period Jan. 1, 1907 to Sept. 1, 1910.*

Receipts: 1907 to September 1, 1910.

Capital stock:	
Issued for cash	\$ 12,000.00
Issued to promoter	1,250.00
	\$ 13,250.00
Cotton grown on an acre in 1909	87.82
C'wpeas grown between trees	1,000.00
Corn sold	3.00
Interest in idle money invested	6.28
owed open account	101.24
Peaches sold, 1910	1,001.26
	\$ 16,148.50

Disbursements: 1907 to September 1, 1910.

114 acres of wild land	\$ 8,848.00
Building: 7-room house, 4-mule barn, shed and tenant's house	1,344.00
1700 peach trees	884.75
Fence	66.45
Well	441.50
Total labor bill, including clearing land	1,800.44
Fertilizer for 3 1/2 years, including all crops	2,602.88
Seed, corn, cotton, peas, etc.	200.00
Pair mules and harness	188.48
Machinery, total	474.00
Feed for mules	16.40
Crates for peaches	236.68
Spraying material	124.00
Taxes	162.08
Legal expense, incorporating, etc.	189.98
Office expense, including auditor and travelling	516.40
Exchange on checks	82
Freight on peaches	204.08
Salary paid superintendent	1,760.00
Insurance	20.00
General expense, small miscellaneous items	186.68
In superintendent's hands. Spent but not accounted for	296.16
Money loaned	32.23
Profit and loss	54.53
Promoter's bonus	1,250.00
	\$ 16,707.89

TABLE II. - *Statement for the 4 years' working 1911-1912-1913-1914*

	1911	1912	1913	1914
INCOME.				
1911 Peaches	\$4,979.52			
Mortgage	2,928.99			
Bills payable	1,990.00			
	\$8,098.51			
1912 Peaches	—	\$10,431.69		
1913 Peaches	—	—	\$15,130.80	
1914 Peaches	—	—	—	\$1,130.80
EXPENSES.				
Mortgage and interest	\$2,132.99	—	—	—
Taxes	17.24	\$28.70	\$42.00	\$1.00
Bills receivable	66.00	—	—	—
Interest, less discount	—	78.15	62.10	1.00
Legal fees	6.00	—	—	—
Fire insurance	—	41.93	—	—
Superintendent's salary	720.00	480.00	480.00	1.00
Freight, expressage, telegrams, and telephone service	195.00	284.59	11.50	—
Crates	695.25	2,081.77	1,075.50	1,000.00
Labor	1,375.08	3,221.04	3,206.08	1,000.00
Repairs, additional tools, etc.	478.81	387.11	147.00	—
Sundry supplies	165.34	138.57	56.93	—
Fodder, grain, etc.	47.05	219.46	216.52	20.00
Superintendent, to account	97.48	—	—	—
Charged proportion of cost of packing house	—	200.00	300.00	—
Fruit trees	—	87.07	53.03	—
Seeds	27.12	33.75	12.00	—
Fertilizer	776.00	591.00	949.51	800.00
Spraying material	160.11	225.11	289.32	20.00
Printing, stationery, postage, etc.	—	—	25.10	—
Bookkeeper and auditor	224.50	—	80.00	20.00
Depreciation on buildings	131.09	—	—	—
Depreciation on machinery, etc.	—	—	—	—
Cash on hand	783.45	—	—	—
	\$8,098.51	\$8,098.85	\$7,008.50	\$1,130.80
Balance, net profit on operations		2,332.84	8,122.30	1,130.80
	\$8,098.51	\$10,431.69	\$15,130.80	\$1,130.80

RURAL ECONOMICS

III. — *Balance Sheet for 4 years' Working 1911-1912-1913-1914.*

	1911	1912	1913	1914
ASSETS.				
Land, 100 acres	\$11,800.00	\$11,800.00	\$13,530.00	
Buildings	2,124.43	4,724.43	4,738.50	
Machine implements, etc.	770.00	850.40	1,024.00	
Stock	750.00	550.00	1,050.00	
Gasoline spraying material	150.00	50.00	75.00	
Cash on hand	1,094.20	905.03	338.25	
Notes	97.70	92.70	—	
Accounts due company,	1,575.10	—	24.00	
Treasury stock, 100 shares	—	—	1,000.00	
Gasoline on hand	100.00	300.00	510.00	
Gasoline on hand	51.00	50.00	—	
Cost of clearing new land	—	—	104.00	
Cost of new water service	—	—	220.04	
	\$15,800.00	\$18,914.22	\$16,488.05	\$10,713.79
LIABILITIES.				
Capital stock	\$13,870.00	\$14,070.00	\$14,070.00	\$17,500.00
Accounts payable	1,000.00	1,700.00	—	—
Accounts payable	—	268.29	—	—
Superintendent, balance	—	—	420.48	—
Surplus, 1911	—	2,875.93	—	—
Profit and loss account, 1913:				
Surplus 1912	\$2,875.93			
Less superintendent's share of				
profit, \$583.21, and sundry				
adjustments, \$64.37	646.68			
.	\$2,229.25			
Profit 1913, \$8,122.30 Superin-				
tendent's share \$2,030.58	6,091.72			
.	\$8,320.97			
Dividend 1913, 45 %	6,331.50			
Surplus	\$1,989.47	—	1,989.47	—
Profit and loss account, 1914	1,989.47			
Balance, 1913, less half amount				
of stock issued to superin-				
tendent	1,737.00			
.	252.47			
Sundry adjustments	33.17			
.	\$285.64			
Profit and dividend, treasury				
stock	250.00			
Profit, season 1914	4,277.05			
.	\$4,813.29			
Dividend, 1914, 15 %	2,629.50			
.	\$2,183.79	—	—	2,183.79
	\$15,800.00	\$18,914.22	\$16,488.05	\$10,713.79

Success has been almost entirely due to the superintendent, whose interest was obtainable only on the condition that he be given a residence in the orchard at the end of four year's work. As a result of the success of this interest the capital stock of the Company has been increased to \$175,300.

Out of the profits as shown in the accompanying balance sheet the company has also planted 25 acres of new trees, has built a big packing house costing \$14,000, bought a new pair of mules, installed a water system, and added a larger spraying outfit.

411 - **The Practical Balance for a Successful Dairy Farm in the United States.** WARREN, G. F., in *Hoard's Dairyman*, pp. 710, 731, 733. Fort Atkinson, Wisc., 1918.

In ordinary dairy-farming practice some of the most important factors for success are the size and diversity of the business, the crop yield, and the receipts per cow. Each of these problems involves many details. For example, good receipts per cow involve the quality of the cow, the method of feeding and management and the marketing of the product. Another factor of more general character and of specific importance in the organisation of every agricultural enterprise is that of the distribution of the work during the year in such a way as to make the very best use of the labour at the disposal of the farm. In agriculture, as in all other manual occupations, a full year's work is normally necessary to make it profitable.

Enough facts about farming are now available to give us a knowledge of how much work it takes to make a full year. Cost accounts on many farms show that the entire care of a dairy cow, except raising the feed, requires 140 to 150 hours per year. Sometimes the work is done in two halves.

Most successful farmers work about 2,500 to 3,000 hours in a year. If this is called a year's work, it would require 20 to 25 cows to provide full employment for one man. The writer has indeed actually visited several farms where one man does milk and care for 25 cows, but obviously such a plan is not practical. However, it is practical to have two men on for this number of cows and spend half their time at other work.

In order to compare farms and thereby learn what factors contribute to making a good profit, we must have some standard of comparison. Labour income, or the wages that the farmer makes for himself is the best means of comparison. To obtain the farmer's labour income all farm expenses are subtracted from the farm receipts. The difference represents the amount that the farmer and his money earned. Subtracting interest on the capital at 5 per cent, we get the labour income.

If some member of the family other than the operator helps with the farm work and does not receive wages, the amount that it would cost to hire this work is called an expense.

The writer then proceeds briefly to examine the influence of the chief factors: size of the farm, dairying combined with the crop production and the milk yield of each cow, on the labour income of the owner.

Size of farm. — In the case of 142 farms in the county of St. Lawrence, New York, attention has been paid to the influence on the labour income

with the total number of cows and the milk production of each. In this locality dairying is the only important industry; 80 per cent of the income comes from the sale of dairy cattle and milk.

Good pastures are available, but not much good land is available for growing crops for sale. The only important crops are hay, maize for the feed and oats. Practically all the grain feed for cows is purchased. Under such conditions, it is evident that the number of cows kept is a good gauge of the size of the business. The results for the 142 farms are set out in Table I.

TABLE I. — *Relation of Number of Cows to Labour Income in a Region Selling little but Dairy Products.*

Number of cows	Milk sold per cow		
	\$ 70 or less	\$ 71 - \$ 80	Over \$ 80
	Labour Income	Labour Income	Labour Income
Less than 20	\$ 300	\$ 487	\$ 435
20-30	397	780	1,152
Over 30	630	922	1,774

As will be seen from the table, the farmers who have less than a median farm, that is, less than 20 cows, are on the average not making more than a hired man's wages. But those who have more cows are doing better.

Table II shows the relation of the size of farms to profits on 579 farms in Livingston county, New York. This is a grain growing, general farming and dairy region.

TABLE II. — *Relation of Size of Farm to Labour Income in a Region that Combines Dairying with Cash Crops.*

Acres Farmed	No. of farms	Average area	Average tillable area	Labour income
Less than 20	17	20	17	\$ 54
20-40	35	44	37	205
40-60	147	79	64	437
60-80	178	127	104	593
80-100	89	175	142	931
Over 100	112	305	241	1,082

Source: *Report of the New York Agricultural Experiment Station, 1912*, p. 10.

The results indicate that, on the average, in this region about 200 acres are required for a very successful farm. Of course, some of the farms are successful, but evidently they are working at a disadvantage. The larger farms are better equipped with horses and machinery, so that they do not suffer these costs so much per acre as on the small places. One man is sufficient for 20 to 30 acres of general farm crops. If one is to make a great saving in human labour that comes from driving three and four teams, he evidently needs 80 or more acres of crops to keep them busy. A mixed farm requires for other reasons another 100 acres of land for horses, but in order to obviate over-working of the two labourers, the number of cows should be reduced to between 10 and 12. In the most dairy regions in the United States this means a 100-acre farm, the remaining 80 acres being used for pasture, woods, roads and farms.

Several years ago, an agricultural journal made a study of farms rated by its subscribers. These farms averaged 167 acres and grew 100 acres of crops per farm besides pasture and woods. These farms kept an average of 16 cows and 6 horses. They are much larger than the average farm and make labor incomes much larger than the average farmer makes.

In the irrigated zone of Logan, Utah, instead of two or three cows being required to pasture one acre, as is the usual average in dairy regions, the rich soil and abundance of water make it possible to pasture two or sometimes three cows on one acre. Alfalfa gives large yields per acre. Sugar beets are the important cash crop. Under these unusual conditions a farm of 50 acres may be as large a business as 100 acres is in some other regions.

TABLE III. — *Relation of Receipts per Cow and Cash Crops to Per Cent. of Receipts from Crops on 585 Farms with 6 or more Cows, Jefferson County New York.*

Per cent. of receipts from Crops	Receipts per Cow from Milk and Its Products		
	\$ 50 or less	\$ 51 - \$ 75	Over 75
	Labour income	Labour income	Labour income
No crops sold	\$ 50	\$ 57.2	\$ 62.7
1-20	311	589	672
21-30	426	947	1117
41-60	551	1366	1617
Over 60	509	*	**

* Only 2 farms in this group.

** No farms in this group.

Diversified and Specialised Dairy Farms. — Table III shows that the men who derive at least a part of the income from the sale of cash

Type of work	January	February	March	April	May	June	July	August	September	October	November	December
Stable of 42 cows:												
1 bull, 10 heifers	625	470	407	528	433	350	368	303	204	303	372	510
9 Horses	37	23	50	45	64	55	37	31	37	50	23	31
Mature	31	50	23	45	42	—	37	92	60	31	56	37
1-donors 1012	—	50	193	—	—	—	—	—	—	—	—	—
Potatoes 107 acres	—	—	—	45	225	170	101	18	—	221	—	—
Maize 102 acres	—	—	—	147	11	105	92	36	184	27	—	—
Oats 418 acres	—	—	—	110	110	—	23	276	—	206	—	—
Outs 1011	—	—	—	—	—	—	—	55	73	—	73	—
Wheat 1044	—	—	—	—	—	—	—	—	—	—	—	—
Hay 1017 acres	—	—	—	204	—	—	728	—	—	—	—	—
Alfalfa 46 acres	—	—	—	—	18	55	—	—	—	—	—	—
Cabbage 67 acres	—	—	—	—	23	165	18	60	18	110	23	—
Poultry 188 head	14	14	9	9	9	9	9	9	9	9	9	14
Farm	14	—	—	18	110	193	61	138	221	55	—	—
Stall	14	70	175	56	74	60	83	—	—	—	—	23
Equipment	—	—	—	—	—	—	31	—	60	18	18	—

make much more than do those who sell nothing but dairy products. There are many reasons why it pays to combine crops with dairy farming. One reason is that two men can milk 15 to 20 cows and yet have half the time for field work. This is more time available than is necessary to raise feed for the cows. The horses kept on the farm also have time to raise crops than feed.

Another reason why such crops help is that the manure is much more effective when spread over more land than when it is all used on the crops that raises feed for the cows.

This point is well illustrated by a test continuing for 21 years at the Ohio Experiment Station. When 4 tons of manure were applied per acre every 3 years, each ton of manure gave increased crops worth \$3.44 per ton. But when twice as much manure was applied on the same land, the additional amount gave crops worth only \$1.95 per ton of added manure.

The dairyman is particularly fortunate if he can combine some high priced crop with dairy farming. In some States, fruit, potatoes, corn or cabbages are very profitable crops to combine with dairying. In irrigated regions sugar beets are commonly grown on dairy farms. All such intensive crops give a very large return for manure.

In the maize belt one of the most profitable systems of farming is a combination of dairying and hog raising.

There are many reasons why at least some cattle should be kept. Cattle use up products that would have little value on the market, such as stover, stalks and low grade hay. Perhaps the point of most importance is that they provide for a full day's and for a full year's work.

Table IV shows the annual distribution of man labour for a dairy farm giving excellent profits.

The labour is supplied by 3 men occupied the whole year round, and a temporary outside help at harvest time. The dairy herd averages about 110 cows and 187 acres of crops are grown. The cash crops are the best ones for the region: potatoes, cabbage, timothy hay. The combination makes a very efficient business.

Milk yield of individual cows.—The importance of good returns per cow is shown in Table V, which gives results for 585 farms in Jefferson County. They are divided into 5 classes according to the average yield per cow.

Similar figures have also been obtained from several other dairy regions.

The principal problem in the organisation of a dairy farm consists in establishing a perfect balance between the 3 factors mentioned for each particular region. This being so, what is required is a careful examination of each of these factors in order to determine which of their number is capable of modification in order to obtain the best results.

The method of procedure for this analysis is exemplified in Table VI.

TABLE V. — *Relation of Receipts per Cow from Milk and its Products to the Receipts on 585 Farms with 6 or more Cows in Jefferson County, New York.*

Receipts per cow	Average receipts per cow	Number of farms	Labour income
Under \$ 50	\$.22	45	\$ 241
\$ 50 . . . . .	.42	178	304
\$ 75 . . . . .	.63	221	704
\$ 100 . . . . .	.86	111	600
\$ 100	1.10	30	1,320

TABLE VI. — *Relation of Various Factors to Profits.*

	Farm No. 1	Farm No. 2	Farm No. 3
Size in acres	52	230	250
Yield of crops	20	133	100
Number of cows	11	20	32
Receipts per cows	\$ 110	\$ 95	\$ 90
Yields in relation to the average of locality	double	$\frac{3}{4}$	$\frac{1}{4}$
Percentage of receipts that come from crops	21%	16%	4%
Net income	\$ 680	\$ 1664	\$ 1133

As seen above, No 1 is a very well balanced farm but is too small. The weak points in No 2 are the crop yields. A neighbour who had all the factors almost exactly the same, except that he had good crops, made a labour income of \$ 2239. In the case of Farm III the owner had nothing to pay for his year's labour, yet he raised very much better crops than his neighbour, No 2, and kept more cows. His weak spot is in the returns from cows. If these were as good as on Farm No 2 this farmer should make at least \$ 1500.

Profits and Loss in the Dairy Business of Chemung County, New York, United States.—CHUBBUCK M. E., in *American Agriculturist*, Vol. 96, No. 25, pp. 50, New York, December 18, 1915.

The Chemung County Farm Bureau has published the results of a careful research in order to ascertain the profits and loss in the dairy business of the County. The following points were determined:

- a) The feed cost of cows on each farm;
- b) The medium production per farm;

c) The relation between these two factors and the labor of the farmer.

The results are summarised in the two following tables; the first gives the average results for the whole County, and therefore for both hill and valley farms, while the second gives those of 115 valley farms. In each table the farms are divided into 5 groups according to the average cash returns per cow.

TABLE I. — *Cost of feed per cow in Chemung County.*

Gross receipts for milk and butter per cow	Feed raised	Feed purchased	Total feed	Milk and butter receipts per cow	Profit above feed cost
\$ 50 and less	\$ 38	8 7	\$ 45	8 37	\$— 8
\$ 51 to \$ 75	40	11	51	62	11
\$ 76 to \$ 100	44	16	60	87	27
Over \$ 100	48	18	68	119	53

TABLE II. — *Receipts per cow, 115 valley farms.*

\$ 50 and less	\$ 42	8 7	\$ 49	\$ 42	\$— 7
\$ 51 to \$ 75	47	8	55	63	8
\$ 76 to \$ 100	53	15	68	87	19
\$ 101 to \$ 125	52	19	71	110	39
Over \$ 125	53	23	76	140	64

(1) The farmer's labor income is obtained by subtracting from the gross profit the interest of capital at 5%; the labor furnished by members of the family figures in the expenses and is estimated according to the equivalent local labor; the farm produce taken for home use constitutes, on the other hand, a further benefit to the farmer besides the remuneration thus calculated for his personal labor and management.

Source: *Chemung County, Pennsylvania, 1911*, p. 10.

The five groups of farms, classified according to the average returns per cow, show a series of clearly defined relations represented, first place, by the progressive increase of the farmer's labor income in proportion to the progressive increase of the average returns per cow; by the increase of purchased feed in proportion to the increase of production of raised feed; by the increase in production of raised feed in proportion to the increase of total feed consumed, with a constantly progressive relation to purchased feed, and a less constant one to feed raised on the farm; may therefore be concluded that, though the labor income in the seven groups of farms thus divided is the result of factors that may have induced

WINE MAKING

in various ways, the first place among these factors must in practice be given to the average production of the cows. This production necessarily depends more upon the quality of the cows employed and upon the quantity of purchased feed they eat than upon the increase in price of the forage raised and consumed on the farm. The great difference to be seen in the average produce of the cows in single farms, and in the farmer's labor costs is chiefly due to the fact that in County Chenung there exists a cow-testing association, numbering 20 members, which has considerably raised the production on the farms belonging to members by eliminating the less productive cows.

In 1914, the average production of 278 cows was 6884 pounds of milk and 215 pounds of butter fat showing an average test of 3.0%.

AGRICULTURAL INDUSTRIES.

Methods of Testing Must. — MENSI CARLO, in *Le Scienze Sperimentali Agricole*, Pisa, Vol. XLIX, No. 1, pp. 35-38, Modena, 1916.

The writer gives a short account of the principles upon which the Geyer and Babo mustimeters are based and shows the errors which may arise in their use.

With regard to the tests of grapes and musts based on their sugar content, especially if this latter is determined by means of mustimeters, the writer observes that no account is taken of non-saccharine extractives, such as acids, colouring matters etc. which are of considerable commercial and organoleptic importance, as it is these extractives which give the wine its distinctive character and distinguish it definitely from a simple alcoholic solution.

In the analysis of musts, it is considered that the Babo mustimeter should be abandoned and one of the two following methods adopted instead:

- 1) *Densimeters* giving the specific gravity of the musts to the third decimal. The specific gravity provides information of a more general type than that given by Babo's method; by the aid of the tables of WINDISCH (or of others which may eventually replace these latter) it enables the quantity of substances dissolved in the musts to be calculated.

- 2) *Saccharometers*, also based on the tables of WINDISCH, giving the total quantity of substances dissolved in the musts and if necessary their density also.

Further, the composition of musts should be studied by more up-to-date methods than those now in use.

Six analyses of musts from the 1914 vintages show the practical application of the principles laid down by the writer.

RICE INDUSTRY

The five stages in the milling process at which these samples were taken are considered very significant. The first rice is from the paddy machine and shows the condition of the grain after the removal of its hull between the stones and the separation of the remaining portion of rough rice. This, then, is brown rice retaining the bran coat and germ nearly intact. Usually, the percentage of whole grains is comparatively large, but it is found that badly sun-cracked rice often shows a considerable amount of breakage even at this stage.

The next stage is concerned with the removal of the bran in the "huller" and pearling cone. The severe scouring to which the grain is subjected is shown in marked decrease in the percentage of whole grains. It is at this stage that most of the breakage in rice milling occurs.

The brush is the polishing machine for the removal of the finer particles of bran. This causes a very slight reduction in the percentage of whole grains, which is recovered in the reeling process, by the removal of the smaller fractions, as brewer's rice.

The final stage concerns the rolling and heating after the application of a coating of glucose and talc. A slight breakage also occurs here due to changes of temperature.

Corresponding to the decrease in the number of whole grains there is also a gradual decrease in the weight per 1000 grains during the milling process.

Chemical Effect. — The product from the "plantation huller" is lower in percentage of ash, ether extract and crude fibre than the rice from the old mortar-and-pestle mills, indicating a more thorough scouring of the grains in the huller. The changes in percentage composition are still greater in rice milled by modern machinery.

The ash content is reduced very markedly when the hulls are removed and one half of the ash which remains is removed by the scouring work of the hullers. During the remainder of the process the decrease is gradual. The total loss by the cleaning and polishing process (from paddy machine to tumblers) is 60 per cent or $\frac{2}{3}$ of the total ash of the hulled rice. The percentage of fat or ether extract is generally increased by the removal of the hulls unless the stones are not properly adjusted so that some of the germ becomes removed. More than 75 per cent of the fat content of the hulled grain is removed in the hullers and the total loss of fat from the finished rice is 85 per cent.

With regard to the crude fibre content, 88 per cent is removed with the hulls and 73 per cent of the remainder during the scouring processes.

Only 10 per cent of the protein content of the hulled grain is removed in the scouring, showing that the aleurone layer is not removed.

Approximately 60 per cent of the pentosans is removed with the hulls and 32 per cent of the remainder during the scouring process.

These changes in chemical composition are much the same in both Japan and Honduras rice.

Commercial products. — Milled rice is graded according to the percentage of whole grains and the size of the particles. Thus Honduras

rice is marketed in four grades: 1) *Fancy head* or "*Head*" rice consisting of about 80 per cent of whole grain and yielding about 59 lbs. per barrel of rough rice; 2) *Second head*, consisting of broken grains yielding 10 lbs. per barrel; 3) *screenings*; and 4) *brewer's rice* yielding respectively 7 and 8 lbs.

Effect of Milling on the Chemical Composition of Rice

Milling stage	Moisture	Ash	Ether extract	Crude fibre	Protein
	per cent	per cent	per cent	per cent	per cent
<i>Honduras Rice:</i>					
Rough Rice	11.27	5.49	1.58	8.97	7.48
Rice from paddy machine	12.32	1.18	1.79	0.99	8.57
" " hulker	12.56	0.53	0.40	0.39	7.77
" " pearling cone	12.50	0.47	0.28	0.30	7.88
" " brush	11.89	0.30	0.25	0.30	8.06
" " trumble	12.02	0.40	0.21	0.26	7.75
Total loss in dry matter	—	6.00	85.00	73.00	10.00
<i>Japan Rice:</i>					
Rough rice	11.05	5.14	1.74	7.93	6.59
Rice from paddy machine	12.38	1.13	1.52	0.85	7.24
" " hulker	13.70	9.70	0.66	0.42	6.82
" " pearling cone	13.38	0.40	0.31	0.29	6.59
" " brush	12.82	0.32	0.22	0.29	6.61
" " trumble	12.50	0.34	0.19	0.29	6.47
Total loss in dry matter	—	70.00	87.00	66.00	12.00

Japan rice is marketed in 3 grades as follows: 1) *Fancy head* or "*head*" containing 90 per cent of whole grains and yielding 96 lbs. per barrel of rough rice; 2) *screenings* and 3) *brewer's rice* each yielding 5 lbs. per barrel.

The mill yield of rice hulls approximates 30 lbs., that of rice bran 20 lbs. and that of rice polishings 6 lbs. per barrel of rough rice.

Chemical analyses of the various commercial grades of rice show slightly smaller percentage of ash, ether extract, and crude fibre in the higher than in the lower or more broken grades. The percentage of protein in the milled Honduras rice is somewhat higher than in the Japan rice.

Rice hulls contain but little ether extract or protein, but are very rich

and crude fibre and pentosans. Bran and polishings are rich in fat and protein and when fresh and not adulterated with hulls are considered excellent stock feed.

The Utilisation of the Residues of Oil Extraction from Olives. — CHAUVET H., *Journal de Tunis, Bulletin de la Direction générale de l'Agriculture, du Commerce et de la Pêche*, 16th Year, No. 88, pp. 271-281, Tunis, November-December 1915.

As a result of his research among the writings of such Latin writers as Varro etc. the writer has been able to identify the *margines* or *marca* of French olive growers with the *amara* of these ancients. Compared to modern practice which usually disregards this by-product these ancients advised its preservation and utilisation.

In order to preserve the *amara* it is boiled on leaving the press, until the milk is reduced by one half, it is then put into vessels in the same way as wine. The Latin agronomists were unanimous in recommending it as a *fertiliser* and as an *insecticide*. Cato recommended watering figs of olives and sterile fig trees with *amara* diluted in water. Columella and Palladius gave similar advice, the latter recommending the "cooked" state for treating the roots of vines. For the control of animal parasites of this latter plant and especially of *Pyralis*, Cato recommends the following method for its employment: after allowing *amara* to settle, concentrate to the consistence of honey, add $\frac{1}{3}$ of refined bitumen and $\frac{1}{4}$ of flowers of sulphur, and finally concentrate whole to the consistency of glue. The product is then spread on the leaves and branches. The same author also recommended the use of *amara* for sheep scab, ants, weevils and parasitic mites, and spoke of its utility as a preservative of skins, leather, wood, metal etc.

The neglect of this residue of the oil press by modern practice constitutes a considerable loss to agriculture. The olive may be regarded as being, by weight: $\frac{1}{3}$ of oil (maximum) and $\frac{1}{3}$ of cake; the remaining $\frac{1}{3}$ is therefore be regarded as the quantity of "margines". The quantity of this product wasted yearly in France may be calculated as 80,000 metric tons. The following analysis by M. BERTAINCHAND will serve as a basis for the estimation of lost fertilising matters:

1 litre of "margines", density 1150-1155 contains in gms:

Oil matter	21.20	Phosphoric acid	0.39
Ash	12.41	Chlorine	2.52
Water	6.76	Nitrogenous matter	3.98
Residue	0.58		

The annual loss would thus amount to:

metric tons—		metric tons—	
Mineral matter	19,300	Lime	600
Phosph	9,800	Phosphoric acid	400
Nitrogenous matter	3,200		

The whole of the above should be returned to the soil. The crop should not be great provided the "margins" are used in the same way as in Liguria and as advised by a number of writers (1).

The writer draws attention to the fact that COUPET and others have recommended the use of the "margins" as a fertiliser and in their trial as insecticide, either in powder or wash form, against insects for instance.

419. — **A New Yeast Preparation for Use in the Estimation of Crystallizable Sugar Inversion.** — PELLET, H. in *Procès-Verbaux de l'Association des Chimistes de la Sucrerie de Distillerie*, Vol. XXXIII, Bulletin No. 1-3, pp. 12-13, Paris, September 1915.

The above is an account of the different methods which have been proposed and applied for the estimation of crystallizable sugar by means of inversion by the aid of yeast or of its extracts with remarks on their advantages and drawbacks. A description is also given of a new method of rapid preparation of a highly active yeast which is devoid of draught and is capable of conserving its properties for a long period.

It has been observed that on adding to the sugar solution 0.2 g. of salicylate of soda per 3 grms. of baker's yeast, liquefaction of the sugar is practically instantaneous. This syrup of yeast or of invertase is capable of retaining its qualities for a long period. When required for use it is only necessary to dilute 30 grms. in 100 cc. in order to obtain a yeast liquor which also keeps for a long period. For purposes of inversion 10 cc. are added to 50 cc. of the specially prepared sugar solution to be inverted (neutral and free from lead). The mixture is heated in the water bath for half an hour at 55° C., allowed to cool, made up to 100 cc. in volume and shaken. In the case of solutions of molasses addition is made of 1 g. of animal charcoal used for decolorising wines. The mixture is shaken, filtered and a small quantity of dry tripoli added, the whole shaken and filtered afresh, care being taken to protect the filter and glass from evaporation. Polarisation is effected with the 200 or preferably with the polarimeter and the crystallisable sugar estimated by means of the ordinary formula with the substitution, however, for the constant 144 (CLERGEY) of 141.8 (German formula and method) of the constant 141.8 or 141.9 $\times 10^2$.

The writer intends to return to the study of this constant and to indicate the exact method for its determination in each case.

The advantage of the yeast with addition of salicylate of soda is that it is easy to prepare and large quantities may be prepared at a time. The necessity for preparing more or less pure solutions of invertine is avoided.

This decoction of invertine when added to the sugar solution is very active, the operation being completed after half an hour's heating at 55° C., instead of 4 or 5 hours.

Further, there is no cold alcoholic fermentation and the liquid does not require heating before the addition of the yeast.

(1) See B. December 1915, No. 1259.

VARIOUS INDUSTRIES

This method is capable of being applied to all the yeasts known. All that is required to be known is that the quantity of yeast added (3 grms. per 50 cc. of sugar solution) is sufficient to invert an amount equal to 10 grms. of crystallizable sugar in half an hour at 55° C., as in the case of English yeast (a brewer's yeast of high fermenting capacity), in the case of KÄRCHER yeast (low fermentation) and in that of the Parisian baker's yeast. The results obtained are very uniform and it is only necessary to take care in the preparation of the neutral solutions.

It is intended to treat of this latter process in a paper on the analysis of the products of the sugar industry by means of invertine.

Cold Extraction of Cream of Tartar from Grape Marcs by Cambiaggi's Method. (CHIMICA L., in *Giornale Vinicolo Italiano*, 42nd Year, No. 7, pp. 121-124, Casale Monferrato, January 13, 1916.)

The CAMBIAGGI method for the extraction of cream of tartar from grape marcs is based upon cold treatment with commercial soda. The cream of tartar, which is almost insoluble in pure water, readily dissolves in water containing soda, forming a double tartrate of sodium and potassium. The soda solution is passed through the mass of grape marcs from bottom upwards and on emerging at the top, is reconducted in a similar manner through 4 other recipients. On leaving the 5th recipient, the mother liquor is treated with hydrochloric acid and the acid potassium tartrate is precipitated in the form of crystals. The mother liquors remaining are treated with lime and a new deposit obtained of calcium tartrate. The marcs are mechanically treated in order to integrate and compress them in a manner which will allow of a uniform washing through every 10 cm. of each layer. The recipients are square in section, each side 2 1/2 dm. in length and communicate with each other by means of holes 40 cm. in diameter opening in the partitions. At their slow rate of progress the liquors take 1 day to exhaust the contents of a recipient.

The process is completed by the scientific utilisation of the residue. The grape stones are extracted and being rich in oil and devoid of tannin are an excellent cattle feed. The skins, separated from the stalks and freed by means of the "hydro-extractor", dried and mixed with different substances, form a food already appreciated in the trade under the name of *anofarine*. MARCHI's experiments have shown that the small quantity of tartar remaining in the marcs is not only harmless to live stock even stimulates milk flow in dairy cows. One of the chief advantages of CAMBIAGGI's method is that it gives a pure cream of tartar and not a brown one.

Colour Changes due to Micro-organisms in the Distillates of Plants and Flowers.

RAYNOT RESE, in *Journal de Pharmacie et de Chimie*, 10th Year, 7th Series, Vol. XIII, No. 1, pp. 37-46, Paris, January 1916.

The distillates of plants and flowers, particularly those of orange flower, are subject to deterioration correlated with the development of micro-organisms: they become turbid, viscous or thin; their odour and flavour are attenuated; their colour turns to yellow, green or violet.

process satisfactory for the destruction of bacteria, has not proved to be of value as a commercial process. (1).

During the last ten years there has been a rapid increase in the quantity of milk pasteurized, particularly in the larger cities. Milk investigations made in the United States, show that in 7 cities out of 6 with a population more than 500,000 each, more than 50 per cent of the milk is pasteurized. Out of 344 cities with over 10,000 inhabitants 51 have more than 50 per cent of their milk supply pasteurized, 116 have 11 to 50 per cent and 277 have 1 to 10 per cent pasteurized. In the remaining 131 cities the milk supply was not pasteurized. The general tendency is towards the pasteurization of all market milk.

At present, there are three processes of pasteurizing practised in the United States. The first is known as the flash, or continuous process, which consists in heating rapidly to the pasteurizing temperature, then cooling rapidly. In this process the milk is heated from 30 seconds to 1 minute only, usually at a temperature of 160° F. or above. The second is the holder or holding process; this consists in heating the milk rapidly to temperatures of from 140° to 150° F. and holding it for approximately 30 minutes, after which it is rapidly cooled. The third process is known as pasteurizing in the bottle. The raw milk is put into bottles with water-tight seal caps, or devices which fit over the tops and necks of the bottles, protecting the ordinary paper caps from the water, then immersing them in hot water until heated to 145° F. and holding them at that temperature for 20 or 30 minutes. The cooling is accomplished by gradually lowering the temperature of the water until that of the milk reaches 50° F. The writer has also tried with good results another method of pasteurization, namely, a modification of the holder process, which consists in bottling of pasteurized milk at 145° F. in hot bottles which have been steamed for 30 minutes immediately before filling. The bottles are then capped with protective caps, and cooled by spraying or by forced cold air circulation. (2).

The process of pasteurization is frequently performed improperly. Records obtained in 1912 from 231 milk plants showed that 69 per cent of those which used the holder process pasteurized at the proper temperature. Among those which used the flash process only 57 per cent employed temperatures high enough to give satisfactory results. The pasteurization of milk by the holder process usually destroys about 99 per cent of the bacteria, but often the milk is re-infected during the cooling or filling of the bottles. In order to obtain a supply of sanitary milk in the cities a direct supervision of the milk plants is necessary, both as regards the cleanliness of the localities, the health of the cows, etc. In the control of pasteurization it is essential that the proper temperature be used and that the process be so performed that no re-infection takes place. This can best be accomplished by trained men who have authority to carry on such supervision, and by bacteriological control of the process. Bottles should be

¹ See *B.*, Jan. 1912, N. 106.

² See *B.*, Oct. 1915, N. 1075.

marked "Pasteurized" and show the date and the temperature at which the milk was treated.

The number and kind of bacteria that survive pasteurization depend entirely on the temperature to which the milk is heated. Experiments made by the writer have shown that with pasteurization at a temperature of 145° F., the acid group of bacteria remains more numerous than the alkali and peptonizing groups; and moreover, that certain classes of streptococci and part of the colon bacilli contained in the milk may also survive that temperature. (1). One of the reasons of the objection to pasteurization is that it destroys the acid-coagulating bacteria and leaves the peptonizing bacteria living, but this reason is based on the results of high temperature pasteurization and is not applicable to the holder process now generally practised in the United States.

Pasteurization by the holder process is in all cases superior to the flash process. From a bacteriological standpoint, pasteurization at 145° F. gives assurance, so far as we know, of a complete destruction of disease-producing bacteria and at the same time leaves in the pasteurized milk the maximum percentage of the bacteria that cause milk to sour (lactic acid bacteria) and only a small percentage of those that cause it to rot (peptonizers), the milk thus remains sweet for a longer period. From a chemical standpoint the advantage of low temperatures lies in the fact that milk pasteurized at 145° F., for 30 minutes, does not undergo any appreciable chemical change such as would affect its nutritive value or digestibility. It is now known to have little effect on the beneficial enzymes in milk and that the soluble phosphates of lime and magnesia do not become insoluble. (2). Pasteurization does not therefore injure the digestive or nutritive value of the milk even for feeding babies. According to the experiments made in this line by WELB, the slight difference was in favour of pasteurized milk. Finally, from an economic standpoint the cost of pasteurization is much smaller for the holder than for the flash process, the latter requiring 17 per cent more heat than the former.

From a series of tests in five establishments considered as representative of the average city milk plant, BOWEN found that the average cost of pasteurizing 1 gallon of milk is little more than three-tenths of a cent \$0.0031 (3). This includes all the expenses necessary for heating and cooling the milk, coal, cooling water, labor, interest on invested capital and repairs.

450 - **Advantages of Using Milk of Low Bacterial Content in Studying the Phenomena of Lactic Fermentation.** — BERG, R. and HOHL G., in *Schweizerisches Zentralblatt für Milchwirtschaft*, Year 5, No. 2, pp. 12-14; No 3, pp. 10-23. Brouge, January 20, 1916, 1916.

The object of the writers is to increase our knowledge of the principles underlying the lactic fermentation test. Experiments are in progress at the Dairying and Bacteriological Institute of Berne-Liebefeld and to

(1) See *B.* July 1913, No. 804; *B.* Dec. 1914, No. 1173; *B.* June 1915, No. 643. — *IF.*

(2) " June 1913, No. 803.

(3) " March 1915, No. 319.

will be published at intervals under the title of "Contributions to knowledge of the scientific principles underlying the lactic fermentation test". The present abstract is from the 1st portion of the series.

The researches of a large number of scientists, those of the present included, have shown that of the total number of bacteria contained in the milk immediately after drawing, $\frac{1}{10}$ th are derived from the rest of the udder. Opinion is divided as to the properties of these bacteria; by some they are considered to be harmless and without any effect whatever on the quality of the milk and its derivatives, while others hold the opposite opinion. The present writer obtained from 4 cows, years of aseptic milking, milk samples with very low bacterial content: average of 200-300 per 1 cc. The enumeration of the bacteria was set out on cultures prepared by 3 different methods; the numbers were in complete agreement notwithstanding the fact that the experiments extended over 3 different periods, each of several days duration. The rest of bacteria were found to vary from cow to cow, even when the animals were side by side in the same stable. Further, the species were all constant for the same cow. Consequently, it may be safely concluded that these bacteria are derived from the interior of the udder and not from mil sources.

The species found were: *Bacterium Güntheri* liquefactive in the milk of cow 1st; white liquefying micrococci for the milk of the 3rd cow and living micrococci and streptococci in the milk of the 4th. The fermentation test applied to these samples has shown that the liquefying *Bacterium Güntheri* is the chief factor exerting an unfavourable influence on the phenomena of lactic fermentation. This organism causes the formation of curd whose degree of consistency is intermediate between that of curd and that of whey-curd.

It also produces a large amount of serum possessing a bitter flavour. The milk sample containing almost exclusively liquefying white micrococci the curd formed was somewhat cheese-like and in that containing streptococci in addition to the white micrococci, the consistency of the curd rather resembled that of whey-curd.

If these results are not sufficient in themselves to explain the whole of the unfavourable phenomena observed in the lactic fermentation test milk obtained from these same cows, at any rate they show that the bacteria of the udder are not always inoffensive and may possibly have injurious effects on the quality of the milk and its derivatives. The fact that apparently healthy cows may harbour, in the udder, during a period of several weeks, practically pure cultures of suspicious bacteria (*Bacterium Güntheri* liquefying and streptococci) merits attention. In future, when coming into the defects of milk and in attempting to explain special cases arising in the utilisation of milk, it will be advisable to make use of the samples of milk containing only bacteria from the udder.

454 - **Milk Quality as Determined by Modern Dairy Score Cards.** -- FREDERICK L. HARRIS.
New York Agricultural Experiment Station Bulletin, No. 398, pp. 167-182, 1913.
March 1913.

Dairy score cards were originally designed to instruct the farmer in the proper care of his dairy and to serve as a convenient record of sanitary conditions. They have thus led to a common belief that there is a relation between the scores obtained and the quality of the milk produced by it. In order to prove or disprove this belief had any foundation, the writer has made a comparative study of the bacterial content of the milk and the scores of 34 commercial dairies made on three representative cards; the first card is the Official Score Card of the Official Dairy Inspectors' Association, now adopted for use by the State by the State Board of Health; the second is the one in use by the New York City Board of Health; and the third the one then in use by the Department of the Agricultural College at Cornell University.

In order to obtain accurate results, the writer himself undertook an investigation of the three systems, making himself personally familiar with each card and the manner of its application.

The samples of night milk and morning milk from each dairy were examined, were taken daily directly from the can as it was placed on the milk station platform, taken at once to the laboratory and plated on lactose agar. The results of the comparison between the bacterial counts of the milk and the dairy scores of 34 farms are given by the writer in several tables and a diagram.

These results prove that no correlation whatever exists between the number of bacteria contained in the milk and the scores expressed on the cards. Dairies with high scores produced milk with relatively high bacterial counts, while the best quality of milk from a bacterial point of view was produced in low-scoring barns. On the other hand, the scores obtained by the three cards when applied to the same conditions generally varied in the case of the three best dairies, while for the other 31 dairies there were instances of wide variations, so much so that dairies which should have been scored as "good" and even "excellent" according to one system would by another system be absolutely excluded. None of the 34 dairies under consideration scored below the exclusion point on either the Official or Official card, while 15 dairies scored below this point on the New York City card.

The writer believes that the reason for which no correlation exists between bacteria counts and the scores obtained by these three systems lies in the fact that a large number of the items included on the score cards have little or no effect upon the number of bacteria present in the milk, while too little emphasis is placed upon the factors which actually determine the quality of the milk. The results secured in this investigation show that the present dairy score cards cannot be satisfactorily used as a means of grading milk according to quality. There is little hope of designing a score card which will accomplish this purpose until all the factors which are thought to influence the quality of the milk in any way have been carefully studied and the influence of each determined and accurately measured. In this way

important factors can be singled out and given the proper values on the score card, thus strongly influencing the improvement in quality and quantity conditions of the milk supply.

The Detection of Added Water in Milk in India. LEONARD J. WAGNER, *1*

Food Research Institute, Food Bulletin No. 87, pp. Calcutta, 1918.

The detection of added water in milk depends in Europe usually on the percentage of "solids not fat", which, according to English law, should not be less than 8.5 per cent. This method cannot, however, be applied in India, where the milk sold in towns consists of cows' and buffaloes' milk mixed. The percentage of solids-not-fat in these is not identical, that of buffaloes' milk being generally greater because of the higher percentage of proteins it contains. The mean percentage of 150 samples of milk taken from 48 buffaloes and as many cows was 0.81, the probable error being ± 0.14 . The buffalo milk vendor can thus add from 10 to 20 per cent of water without fear of detection.

The method adopted was that of detecting added water by the freezing point of the milk, which, according to the Queensland Government standard, should not be higher than -0.55°C .

During the last two years, opportunities have been taken of ascertaining the freezing point of genuine milks at Government dairies in India, the list of the samples being those of single cows or buffaloes. The amount of proteins contained in the milk affects the freezing point only in a minor degree, so that the freezing point of the two kinds of milk would be presumably about the same. The writer gives a table with the freezing points of 77 samples of cows' and buffaloes' milk tested in five different parts of India. The individual variations are considerable, but the samples have been mostly those of single animals, whereas the milk sold in towns is the mixed milk of a number, in which the variation is naturally less. The mean freezing point of all these 77 samples was -0.541°C , and the probable error ± 0.00097 .

The effect on the freezing point of adding water to milk is substantially linear and may be expressed by the equation $W = ax$, where W = added water expressed in a percentage of the sample, x = F.P. of pure milk minus that of the sample; a = a constant. The writer has estimated the value of a in the equation from the freezing points of a series of portions of the same milk to which different (known) quantities of water had been added; the series of these tests yielded $a = -172$. As WINTER'S table gives $a = -176$, the writer holds the difference between the two to be immaterial and that -174 may safely be taken as a good value. The equation then becomes $W = -174 \{-0.542 - t\}$ where t is the freezing point of the sample. Judging by the probable error which accompanies the mean value $= 0.542^{\circ}\text{C}$, a freezing point of -0.507°C , is possible once in a hundred times in the case of the milk of a single cow or buffalo; such a case would indicate 6.1 % added water. Such a case is not to be expected from mixed milks. Considering that the dairyman who waters his milk will not add so little as 5 per cent, it is quite certain that adulteration with

water can be detected by the chemist with certainty by the method based on the freezing point.

The writer, after some technical remarks on the manner of determining the freezing point, gives a table of the percentage of added water corresponding to the freezing point of the sample, ranging from -0.512°C . to -0.247°C .

451 - **The Chromogenic Micro organisms of Cheese and their Presence in the Italian "Robbiola".** — DALLA TERRE GIULIO, in *Le Stazioni Sperimentali Agrarie*, Vol. XLIX, No. 1, pp. 59-67, Modena, 1916.

The writer first gives a list of the principal chromogenic micro-organisms occurring in cheese, with notes on their action, and subsequently the results of a bacteriological analysis of a sample of "robbiola" cheese. The interior of the cheese was slightly spongy and the exterior covered by a thin yellow layer which enveloped the entire surface like a veil.

Two pieces were taken for analysis, one from the interior of the cheese in order to discover the micro-organism responsible for the sponginess and another from the outside in order to find the species producing the yellow colour.

In the first case, the action was due to a bacterium of the group *Aerogenes-coli* (the writer uses this nomenclature in preference to the usual name of the group *Coli-aerogenes* in order to indicate that this micro-organism is nearer to *B. aerogenes* than to *B. coli*). Of the 13 million bacteria contained in 1 grm. of cheese, 200,000 belonged to the above named group. The remainder was made up chiefly of *B. lactis acidii*.

The principal characters of the micro-organism producing the yellow colouring matter are as follows:

Micrococcus 0.8 to 1 μ in diameter.

Produces a yellow or yellowish green substance.

Necessarily aerobic.

Coagulates the milk and dissolves the coagulate, giving an acid reaction.

If cultivated several times in succession it loses its colouring properties and also its odour.

A comparison with the numerous bacteria producing a yellow substance described by various authors (often very similar to one another) shows no resemblance to any of these latter. Certain of its properties might place it at some little distance from *Micr. chromoflavus* (Huss), but it differs from this species in the following points: 1) by its behaviour towards milk and potatoes; 2) by its odour; 3) by its colour, which tends towards a yellowish green whereas that of *Micr. chromoflavus* is yellow chrome; 4) by the colour produced at the surface of the cheese: yellow or yellowish-green whereas *Micr. chromoflavus* gives a yellowish or reddish brown.

The micrococcus in question must therefore be regarded as a distinct species.

Fermented Milks (1).—ROGERS L. A. in *United States Department of Agriculture, Bulletin* No. 319, 31 pp. Washington, January 10, 1916.

The writer gives a brief resumé of our present knowledge of the subject, as it is treated in numerous both popular and scientific publications; of these 82 of the most interesting and important are mentioned in the bibliography.

The use of fermented milks as a therapeutic agent is based on the assumption that they are able to combat the so-called auto-intoxication caused by the undue accumulation in the body, of toxic substances emanating from the intestinal tract. The lactic acid bacteria introduced into the digestive canal with the fermented milk would there multiply and replace the injurious bacteria which, being in unfavourable conditions, would be driven out. A particular bacterium now universally known as *Bacillus bulgaricus* is supposed to be especially active in suppressing the putrefactive bacteria, because of its vigorous development and characteristic ability to form acid in exceptionally large amounts from sugars, particularly milk sugar. COHENOV, BELOXOVSKY, and HERTER have found that *Bacillus bulgaricus* introduced into the intestine with curdled milk is readily established there, persisting for a considerable time after the subject has ceased to take fermented milk. RABIN concludes from his experiments that this bacillus persists in the intestine for only a few days after the ingestion of culture ceases, and in a recently published paper, he maintains that the difference between *B. bulgaricus* and certain acid-forming bacteria which occur normally in the intestines, is so slight, that they can be distinguished only with difficulty, and he suggests that belief on the part of some investigators that *B. bulgaricus* becomes established in the intestines was caused by their inability to distinguish the two types. It is undoubtedly true that in many cases marked improvement has resulted from the ingestion of milk cultures made from *B. bulgaricus*, but it is by no means certain that the results which have been obtained by the use of milk cultures have been attributable to any peculiar virtue in the organism itself, or that the intestinal flora may have been radically changed by a fundamental change in the diet. In fact, DISTASO and SCHILLER, HERTER, KENDALL and REITGER have found that the nature of the bacterial flora of the intestines could be promptly and distinctly changed by a radical change from a diet high in protein to one in which carbohydrates predominated, or vice versa. The conclusion seems obvious. The bacteria of the high-acid type, which are apparently normally present in the intestines, are stimulated by the unusual amount of milk sugar furnished by the milk-shed, and multiply to such an extent that the ordinary mixed flora is suppressed.

Although the fat is partially or entirely removed in fermented milks, their food value differs little from that of the fresh milk from which it is made. Any increased digestibility of the fermented milk is due, not so

¹ See *B.* July 1911 No. 2215; *B.* Feb. 1912 No. 362; *B.* June 1912 No. 593; *B.* Aug. 1912 No. 717; *B.* March 1913 No. 391; *B.* Sept. 1913 No. 586; *B.* Oct. 1913 No. 686.

(Ed.).

much to change in the chemical nature, as to the fact that the milk is furnished in a precipitated and finely divided condition. In most of the fermented milks there is any material cleavage of the casein toward the digestion in the stomach. The fat is practically unchanged, and only a part only of the sugar is converted into acid, alcohol, or carbon dioxide. The last is believed to aid in the digestion of certain fermented milks.

In large cities several kinds of fermented milk are offered on the market, such as buttermilk, sometimes koumiss and kefir, but more often prepared in other ways. In addition to these freshly prepared preparations, several tablets or capsules purporting to be pure and active cultures of the *Bacillus bulgaricus* are now offered for sale, to use for fermenting the milk. But these, when prepared with care, lose their efficiency very quickly, *B. bulgaricus* being apparently particularly sensitive to dessication; it is therefore advisable that manufacturers should place the date of manufacture on the package and state the time within which the tablets should be used.

Buttermilk is the by-product resulting when milk or cream is churned for butter. If cream is churned sour, the acidity is sufficient to coagulate the casein which in the churning process is broken up into very fine particles. These settle very slowly, and if the buttermilk is agitated occasionally it will retain its milky appearance. When the cream is allowed to sour spontaneously, many bacteria other than the true lactic acid bacteria will take part in the acid formation, and in addition to lactic acid the buttermilk may contain in small quantities acetic, succinic, and formic acids, and sometimes traces of alcohol. To assist and control to some extent the acid fermentation of cream, certain prepared cultures, or starters, may be used which contain selected lactic-acid bacteria. Buttermilk, therefore, is the water of the milk holding the sugar, acids, ash and other soluble constituents in solution and the finely divided particles of precipitated casein in suspension.

Chemically, buttermilk differs but little from skim milk. Only a slight rearrangement is necessary to bring about the physical change in the casein to obtain a perfect substitute for buttermilk. At the present time a large part of the so-called "buttermilk" sold in cities, and also the product sold under the name of "ripened milk" is simply soured skimmed milk which has been churned or stirred in order to break up the curd. The writer gives directions for preparing this buttermilk both for market purposes and home use. The principal point is to secure a culture, or starter, which is merely milk containing the lactic acid bacteria free from other kinds. This may be obtained by allowing the milk to sour spontaneously, or by good artificial preparations. A more nearly uniform product is secured if the milk is pasteurized. The scorched taste which results from pasteurization at a high temperature is obscured by the acidity of the soured milk. After adding the starter, the temperature should be maintained between 21° and 24° C. (70° and 75° F.). As soon as a fine curd has been formed the milk should be cooled promptly to below 10° C. (50° F.) to prevent the contraction and toughening of the curd. A very refreshing and nutritious drink is obtained by adding sugar and lemon to buttermilk.

Kefir is made from the milk of sheep, goats or cows in the Caucasus and neighbouring regions. It differs from most of the fermented milks in that it is made from a dried preparation and contains considerable quantities of alcohol and gas. Small, yellowish, convoluted grains are observed in kefir which are called seeds or "grains". The sediment is made up of a mass of bacterial threads. In the outer yeast cells are found mingled with bacteria. These grains when dried are said to retain their vitality for several years. When they are added to the milk they swell and increase in size by forming new grains. FRIEDENREICH describes four organisms that he isolated from kefir grain. A yeast which he designates *Saccharomyces Kefir* ferments glucose and cane sugar, but not lactose. Two of the organisms were of lactic acid bacteria type, but differed from them in forming gas in lactamella. Another organism, to which he gives the name of *Bacillus caucasicus*, resembles *B. bulgaricus* but differs from it by forming gas from glucose and in being feebly motile. According to FRIEDENREICH, the action of these four organisms in milk produces the typical kefir. NIKOLAIJEVA gives only two organisms as essential to the production of kefir: *Bacillus caucasicum* (evidently identical with the *Bacillus caucasicus* of FRIEDENREICH) and a kind of yeast fermenting lactose, dextrose, and cane sugar. The writer is of opinion that any combination of bacteria, or of both and yeasts that will produce a lactic acid and a mild alcoholic fermentation in milk, will make kefir, although to secure the most desirable flavour certain organisms are essential.

HANMARSTEN shows in the following table the changes brought about in cow's milk by this fermentation:

Chemical Analysis of Kefir.

Constituents	2 days old	4 days old	6 days old
	per cent	per cent	per cent
Water	2.570	2.586	2.564
Albumin	.425	.405	.399
Casein	.671	.689	.629
Lactose	3.700	2.238	1.670
Glucose	3.619	3.630	3.626
Galactose	.641	.624	.630
Starch	.665	.832	.900
Fat	.230	.810	1.100

Kefir grains cannot always be obtained, but a good imitation of kefir can be made by carrying on simultaneously in sealed bottles an alcoholic and a lactic fermentation. Better results can be obtained by inducing alcoholic fermentation in buttermilk. Ordinary bread yeast may be

used for the alcoholic fermentation, but as this yeast does not ferment lactose it is necessary to add cane sugar to the milk. The writer has given detailed directions for preparing kefir.

The nomadic tribes of the plains of European Russia and Central and south-western Asia prepare a fermented drink called *koumiss* from mare's milk. Care is taken to produce an acid and an alcoholic fermentation, the necessary bacteria and yeast being thus soon established. The composition of koumiss is shown in the following analysis taken from RICHMOND'S Dairy Chemistry:

Composition of Koumiss made from mare's milk.

Constituents	1 day old	8 days old
	per cent	per cent
Water	94.43	92.12
Alcohol	2.67	2.93
Lactic acid . . . . .	.77	1.05
Sugar	1.63	.50
Cas. in. . . . .	.77	.85
Albumin. . . . .	.25	.27
Albumose . . . . .	.98	.70
Fat	1.16	1.12
Ash . . . . .	.35	0.35

Source: Richmond.

It will be observed that this fermentation produces no change which could be expected to increase appreciably the digestibility of the various part of the milk, except the possible advantage of a finely divided curd. Kefir and koumiss are limpid, mildly acid and distinctly alcoholic. Yoghurt is a thick-curdled milk, decidedly acid and with very little alcohol. It is prepared from goat's, buffalo's or cow's milk in the countries bordering on the eastern end of the Mediterranean where it is known by different names. Unlike kefir there are no "seeds" through which fermentation can be transmitted, but the essential organism is sometimes preserved by drying the fermented milk and reducing the dry matter to powder. This constitutes the "podkwassa" or "mayak". The bacterium essential for the preparation of yoghurt, was probably first observed by KERN (*Dispora caucasicum*) in 1881. Later, BEYERINCK isolated and described it (*Bacterium caucasicum*), and also FREUNDREICH (*B. caucasicus*). More recently, RIST and KOURHY (*Strepto-bacillus* and *Bacillus lebensis*). GRIGOROFF and COHENOV do not believe it is limited to the oriental fermented milks, and recent work by HASTINGS, NEMANN and HEFFERAN, indicates that this bacterium is widely distributed having been isolated from milk, soil, saliva, fæces, and various sources.

They are slender rods $2\ \mu$ to 6 or $8\ \mu$ in length, breadth usually about $0.5\ \mu$. Flagella and spores absent. Long chains frequently occur. Living cells are gram positive; dead cells are gram negative. This organism does not grow on ordinary media, but on whey, malt, and slowly on whey-agar and certain specially prepared media. Most varieties grow equally well in the presence or absence of oxygen. The ability to ferment sugar probably varies in different varieties. This organism growing alone in milk, forms usually a rather slimy, tenacious curd, which does not ordinarily separate from the whey even on long standing, and cannot be broken up into the smooth creamy condition essential to a good buttermilk. Better results are obtained by adding a culture of an ordinary lactic-acid organism; but the best results will be obtained by making buttermilk in the ordinary way and churning it with an equal quantity of milk curdled with the yoghurt organism. Yoghurt may be made palatable by adding two parts cold water, or better still cold aerated water, sugar and lemon juice or other fruit flavour, or chocolate syrup.

The writer concludes by giving directions for making yoghurt for commercial and for home use.

10. Biochemical Comparisons between Mature Beef and Immature Veal.

BERG W. W. (Biological Chemist, Bureau of Animal Industry) in *Journal of Clinical and Research*, Vol. V, No. 15, pp. 607-711, Washington D. C., January 10, 1916.

In both Europe and America immature veal is popularly regarded as difficult of digestion and unfit for human food.

These investigations were carried to compare immature veal (1-3 weeks old) with mature beef with regard to chemical composition, digestibility and physiological effects.

Determination of the nitrogen compounds showed no significant differences between the two kinds of meat. In artificial digestion experiments with acid pepsin and alkali trypsin, the veal digested as rapidly as the mature beef.

Cats were fed on a diet in which immature veal was the sole source of nitrogen. The young animals grew normally on the diet and the older ones excrete fat. A pair of cats after living two thirds of a year on the diet, produced a litter of healthy young kittens which continued on the veal diet with excellent growth.

These results indicate that immature veal is a very suitable meat when its deficiencies in fat and possibly in small amounts of undetermined constituents are counter-balanced in the ordinary mixed diet.

Almond Growing and Trade in California.—PARKER G. W., in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. IV, No. 11, pp. 403-500, Sacramento, Calif., November 1, 1915.

According to the most recent statistics, the annual almond crop of California, for the least 10 years, has averaged about 3,000 tons. During the planting seasons of the last five years, the acreage set to almonds has been so large that little, if any, of the almond variety has remained in the hands of the nursery man at the close of the several seasons.

In the opinion of the writer, this increase in the almond production will oblige the growers for the future to cooperate and form strong organisations, in order to be able to sell the crop at a sufficient remunerative price, in spite of foreign competition. The annual consumption of shelled almonds in the United States amounts to about 16 000 tons, most of which come from abroad. Of these imported almonds, 80 per cent are shelled, while, so far, the native product is sold in the shell, especially from December to February.

In order to put an end to this state of affairs, on the initiative of the "California Almond Growers Exchange", a large almond-shelling establishment has been started at Sacramento; the capacity of the plant is 100 carload per day. The "California Almond Growers Exchange", of which the writer is President, began in 1910 with 11 local associations and 230 members, it now includes 18 associations and has nearly 900 members. About 80 per cent of the Californian crop is handled by the Exchange.

The writer is of opinion that within the next 5 years, the almond crop will be nearly 15 000 tons, and that the consumption could also be increased. Seeing the difficulties hitherto met with in the sale of the crop, the most important problem that presents itself to the almond grower in California is the marketing of the output. The positive results already obtained by the above-mentioned institution, which sells the almonds at a fair price, encourage the writer to hope that, in the future, this problem will be satisfactorily solved, and that the demand for almonds in America will be entirely supplied by the Californian product.

Brief reference is made to the unfavourable freight rates from California to the chief eastern markets, as compared with those paid for foreign products; and to the insufficient import duty, in view of the lower cost of labour in the exporting countries.

457 - **Trade Standard for the Sale of Wine Lees and Tartar.** — *Giornale Vinicolo*, Bologna, Year 42, No. 4, pp. 66-68. Casal Monferrato, January 23, 1916.

The price of wine lees and tartar is fixed, not only according to their content in tartaric acid or in bitartrate of potash, but also on the basis of an average standard accepted by the trade. For lees, this standard is 15 per cent tartaric acid and 23 per cent bitartrate of potash; for tartar, 68 per cent tartaric acid and 80 per cent bitartrate of potash.

458 - **The Sale of Eggs and Poultry in Massachusetts under Guarantee.** — *The American Agriculturist*, Vol. 96, N. 23, p. 14, New York, December 4, 1915.

The Massachusetts Poultry Society has adopted, for the use of its members, an official poultry products guarantee seal for both eggs and dressed poultry for the market.

The use of the seal is limited to those members of the society who will agree to the following rules:

- 1) That poultry and eggs shall be produced under clean and satisfactory conditions.
- 2) The poultry and killing houses shall be open at all reasonable times to inspection by members of the executive committee of said association.

- 3) Eggs shall be gathered at least once a day, and when shipped or sold shall be not more than seven days old.
- 4) No unwholesome food shall be fed to the poultry.
- 5) Shells shall be clean in every case.
- 6) No eggs which have been in an incubator shall be shipped or sold under said seal.
- 7) Eggs shall weigh not less than 24 ounces to the dozen.
- 8) Dressed poultry shall be fresh killed.
- 9) No diseased poultry shall be killed and sold for table use.
- 10) The right to use said seal is forfeited whenever this agreement is in any respect violated, the member being held to reimburse said association for all payments and expenses made and incurred by it (after investigation and satisfactory proof) by reason and on account of inferior quality of poultry products shipped or sold under said seal.

PLANT DISEASES

DISEASES NOT DUE TO PARASITES OR OF UNKNOWN ORIGIN.

- 450 - **The Influence of Meteorological Factors on the Development of Plant Diseases**
— DOROGIN G. I., in *Materialy po Mikologii i Fitopatologii Rossii*, 1st Year, No. 1, pp. 3-6 (with 1 graph). Petrograd, 1915.

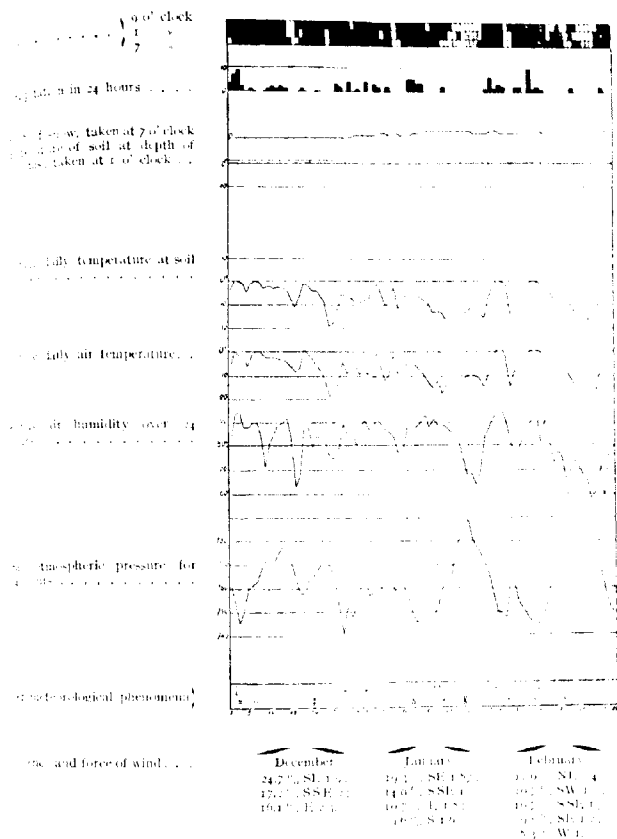
Although it has been long known that meteorological factors exercise a very definite influence upon the appearance and propagation of plant diseases, practically no continuous and methodic work has yet been done on this important problem. The Bureau of Mycology and Phytopathology of the Russian Ministry of Agriculture, aware of the necessity for a continuous series of observations on the development of fungoid diseases in relation to the progress of the weather, has set aside a chapter in its quarterly Bulletin for the publication of meteorological data, accompanied by graphs and diagrams. Observations are made of the following: air temperature, soil temperature (at surface and at depth of 10 to 25 cms.), relative humidity of atmosphere, humidity of soil at surface and at a depth of 10 to 25 cms., total precipitation, cloudiness, depth of snow, frequency and force of prevailing winds. Note is also taken of variable meteorological phenomena, such as extremely high and extremely low temperatures, frosts, hoar-frosts, hail etc. the action of which on plants is obvious.

In order to simplify reference to the Bulletin and its diagrams, instead of the usual 3 observations daily, in certain cases an average is taken for 24 hours or simply of 10 days. Although changes in atmospheric pressure have no perceptible influence on plants, a pressure curve is included in the diagram in order to complete the data.

The following rules have been established for the construction of the diagrams:

- 1) Values equivalent to 0.5 are indicated in the middle of the square; values above 0.5 are taken as equal to 1 and lower values are not indicated at all.

Winter 1914-15.



2) When the thickness of snow is inferior to 0.5 decimeters it is indicated by a single line which practically coincides with zero.

3) The soil temperature at a depth of 25 cms. from 0.5° to 0° is recorded as equivalent to 0.5.

4) The quantity of rain from 0.5 to 0 mm. is indicated by a single line.

5) Cloudiness equal to 4 (sky totally covered) is shown in black; cloudiness equal to 1, 2, 3 (sky $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ covered) in grey. In the case of complete absence of cloud there remains a white square at the corresponding point of the diagram.

- 460 - Yellowing of Sugar Beets in France during 1915 (1). — ARNAUD, J. *Bulletin d'Agriculture pratique*, Vol. 29, No. 3, p. 50, Paris, February 10, 1916.

With reference to the yellowing of sugar-beets observed in the north of France during the summer of 1915, the writer excludes any speculation on the part of a pathogenic agent and is of opinion that the disease is due entirely to meteorological and cultural causes. It is considered to be due in light, sandy, dry soils containing little nitrogen, and similarly in clayey soil of higher ground, the beets must have suffered from want of sufficient water, lack of cultivation and the smaller amount of nitrogenous fertilisers applied, and late sowing.

On the specimens examined were found various fungoid and parasitic parasites (*Cercospora beticola*, *Uromyces Betæ*, *Phoma tabifica* and *Uromyces convulvi*) but they are not considered as being of any importance with regard to the production of the disease.

DISEASES DUE TO BACTERIA, FUNGI AND OTHER LOWER PLANTS.

- 461 - Contribution to the Mycological Flora in the Neighbourhood of Kieff (Russia). JAWORSKI, A., in *Burowo po Mikologiji i Fitopatologii Ucinago Comitea Zemschich i Zemledelcju, Materiali po Mikologiji i Fitopatologii Rossii*, Year I, Part 2, pp. 1-14, Petrograd, 1915.

A list of 72 Hymenocetes collected near Kieff between 1912 and 1915. Among the species injurious to cultivated or useful plants: *Exobasidium Vaccinii* Woronine on *Vaccinium Vitis-Idaea*; *Stereosporium* Pers., on the trunks of hazel, oak and birch; *Merulius laevis* (Wulf) Schum.; *Daedalea quercina* (Linn.) Pers.; *Trametes* fr. fr.; *Polyporus* (*Fomes*) *pinicola* Fries and *Polyporus* (*Fomes*) *fomentarius* L.

The last is nearly always found on birch, less frequently on poplar and alder. The fungus which develops on poplar differs from the characteristic form on birch, by its fructifying organs being less consistent and most devoid of concentric furrows.

Among the Polyporaceae are: *Polyporus Schweinitzii* Fr., *P. squamosus* Fr., *P. sulphureus* Fr., *P. imberbis* Fr., and *P. betulinus* Fr.

- 462 - Contribution to the Mycological Flora of the District of Tersk (Caucasus). VORONICHIN I., J. in *Burowo po Mikologiji i Fitopatologii Ucinago Comitea Zemschich i Zemledelcju, Materiali po Mikologiji i Fitopatologii Rossii*, Year I, Part III, pp. 1-14, Petrograd, 1915.

A list of 91 species of parasitic and saprophytic fungi collected in the summer of 1914 in the district of Tersk. The following are new to science: *Cercospora Lini* Woronich., on the leaves of *Linum catharticum* Waldst. and Rit. and *Rhodosticta onobrychidis* Woronich., on the leaves of *Onobrychis sativa* Lam.

(1) See also B. Jan. 1916 No. 117, and B. March, 1916 No. 337.

Eleven species are recorded for the first time in Russia: *Puccinia pteridis* Lagerh., on the leaves of *Taraxacum* sp.; *Phyllosticta faginea* Peck., on the leaves of beech; *Phyll. physaleos* Sacc., on the leaves of *Physalis alkekengi* L.; *Cytospora liliae* Sacc., on the leaves of lime; *Stagonospora crepus* Hollós, on the leaves of *Sonchus* sp.; *Septoria cruciatæ* Rob. and Desm., on the leaves of *Galium cruciatum* Scop.; *S. melicæ* Pass., on the leaves of *Galium uniflora* Retz.; *S. nepetæ* El. A. El., on the leaves of *Nepeta cataria* L.; *S. poæ trivialis* Cocc., on the leaves of *Poa nemoralis* L.; *Marsonia majeri* Sacc., on the leaves of *Melandrium album* Gat.; *Cercospora veratrum* Peck., on the leaves of *Veratrum album* L.; *Ramularia crocephala* Sacc., on the leaves of *Astrantia major* L., and *Cercospora cypripadii* Ell. et Desm., on the leaves of *Epipactis latifolia* Al.

Amongst the species most injurious both to cultivated and to wild plants are: *Septoria piricola* Desm. and *Gymnosporangium sabinae* Wint., on pear; *Microstoma juglandis* Sacc., which attacks the leaves of walnut; *Botrytis cinerea* Bonord., which produces fruit rot; and *Clasterosporium angustatum* Aderh., which attacks the leaves of *Cerasus*.

Widely spread and common in the zone explored by the writer are also *Cercospora fraxini* Sacc. and *Septogloeum ulmi* Br. et Cav., on the foliage of ash and of elm; more rare are: *Odium dubium* Jaccz. and *Phyllosticta faginea* Peck., which is found on beech.

Contribution to the Mycological Flora of the District of Suchum (Russia)

SIEMASZKO V., in *Buaro po Mikologhii i Fitopatologii Kavkazskoi Chucheti, Zonadistichna i Zonadichna Materiala po Mikologhii i Fitopatologii Kavkazskoi Chucheti*, pp. 11-17, 1128, 1936, Petrograd, 1935.

A list of 217 species of fungi collected during the autumn of 1913 and during 1914 in the district of Suchum and other parts of Transcaucasia along the coasts of the Black Sea.

The following are new to science: 1) *Mycosphaerella phaseolorum* Siemaszko, a Pyrenomyceete which, occurring on the leaves of *Glycine soja*, *Pithecellobium mungo*, and *Vigna rubia*, forms whitish spots with a darker border; this fungus is very similar to *Mycosphaerella phaseolicola* (Desm.) Sacc., from which, however, it differs in shape and in the dimensions of the spores; 2) *Sphaerulina suchunica* Siemaszko, another Pyrenomyceete, which was found on the leaves of *Gossypium herbaceum* and *Hibiscus exultans*; 3) *Exobasidium citri* Siemaszko, which attacks the unripe fruit of *Citrus* sp. on which it develops as a whitish, hard, sclerotic crust; mandarin is the favourite host-plant; this disease resembles very closely in its external characters the "mealmaturata" of the lemon of SAVASTANO and "white rot of lemons" described by BRIOSI and FARNETI, which, according to those writers, is due to *Ocularia citri* Br. et Farneti, together with several other fungi; 4) *Cercospora epimediti* Siemaszko, which forms on the leaves of *Epimedium pinnatum* var. *colchicum*, large round spots of a dirty white with dark-grey border; this fungus was found in a forest on the banks of the river Kelossuri near Suchum; 5) *Ramularia trachystemonis* Siemaszko which forms a whitish veil on the leaves of *Trachystemon orien-*

talis; 6) *Cercospora guizotiae* Siemaszko, which causes grey spots on the leaves of *Guizotia oleifera*.

164. **New Record of *Puccinia Galanthi*, in Austria.** — KEISLER K. in *Botanische Zeitschrift*, Year 65, No. 7-8, pp. 230-238, Vienna, 1915.

In 1833 a new fungus was reported by UNGER as occurring on the leaves of *Galanthus nivalis* taken from the meadows near Stockerau in Austria. He named this fungus *Puccinia Galanthi*, but no accurate description was made. The parasite was lost sight of for a long time until VON BECK found it in his garden at Währing, near Vienna. The fungus has been described by WINTER.

At about the same time, the presence of *P. Galanthi* was reported in Hungary by LINHARD.

Fifteen years later, in 1897, BUBAK reported a new habitat of this fungus in Moravia and described the parasite.

Up to 1897, therefore, this fungus had been recorded in four different habitats; since that date there is no further record of its occurrence.

During an excursion made in May 1915, in the valley of the Danube the writer found no trace whatever of the fungus. A week later, in visiting the same places, he found it in such quantities as to be able to make a good collection. It was also noticed to occur on very young plants.

The distribution of the fungus shows clearly the existence of a zone of infection where the plants are very strongly attacked, while towards the periphery of the infected zone the fungus becomes gradually rarer.

Research on the method of reproduction of *P. Galanthi* has shown that the spores occur on the under surface of the leaves.

As it forms no spots on the leaves it is extremely difficult to identify. Research on this point is being continued. From a systematic point of view it is noted that *P. Galanthi* closely resembles *P. Schroeteri* and that it attacks *Narcissus poeticus*.

Besides *P. Galanthi* another species of Uredineae is reported, *Uredia Galanthi*, Schröt., which differs from the first by the paler colour of the spores. The teleutospores develop on *Salix fragilis*. This species has already been reported from several places.

Both these rusts have been found repeatedly on the same localities and no genetic relation is thought to exist between them.

165. **Relation between the Concentration of Hydrogen Ions and the Natural Immunity of Plants.** — WAGNER J. in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionsheilkunde*, Vol. 41, No. 24-25, pp. 708-719, Jena, January 12, 1916.

The writer had previously noticed that the injection of phytopathogenic bacteria into certain plants, produced in their tissues, in addition to bactericidal substances, a variation in the concentration of the hydrogen ions.

Plants of *Sinapis alba*, *Brassica oleifera*, *Sempervivum* Henslowii and tubers of potatoes were inoculated with pure cultures of *Bacillus gatus* or of *Bac. phytophthorus*, or of *Pseudomonas campestris*. *Brassica* and *Sempervivum* were kept in an unheated glasshouse. *Solanum* and *Spiraea*

the open. The potato tubers were kept during the experiment in a receptacle at a temperature varying between 22° and 30° C. Before injecting the bacteria, the portion of the plant treated was washed in a 1 per cent hydrogen peroxide and well dried with alcohol. Some time after the injection, a sample of sap was taken from the plant and tested for its bactericidal power and for its acidity or the concentration of the hydrogen ions. The variations in the concentration of the ions are regarded as part of the reaction against the injection of the phytopathogenic bacteria. Immediately after the injection the acidity of the sap decreases, but increases again immediately the first symptoms of the disease appear. If after injection the plant is able to resist the disease, the concentration of the hydrogen ions decreases and after a certain time becomes the same as in healthy plants. When the plant is unable to withstand attack, the concentration of the hydrogen ions augments greatly, subsequently falling below that of normal plants.

27. **Sugar canes Resistant to Root-rot and Maize Resistant to Insect Attacks, in Cuba.** See No. 340 of this Bulletin.

28. **Angular Leaf Spot of Cucumbers in America caused by *Bacterium lachrymans*.** — SMITH ERWIN F. and BRYAN MARY KATHERINE in *Transactions of the American Phytopathological Society*, Vol. V, No. 11, pp. 465-478, Pl. XI, XII, XIII, Washington, D. C. 1915.

The angular leaf spot of cucumbers (*Cucumis sativus*) has been known in the field for many years, but so far no organism has been named as its cause, though it has generally been conceded to be of bacterial origin. F. F. BURGER, of Florida and G. B. TRAVERSO, in Italy (1), are responsible for most of the literature on the subject.

From the examination of material from a number of different sources, the writers have identified and described the organism responsible for the disease as *Bacterium lachrymans*.

The disease is characterised by angular brown spots which tear or drop off when dry, giving to the leaves a ragged appearance. Young stems and petioles may become soft-rotted or cracked open. In the early stages the bacterial exudate collects in drops on the lower surface during the night and dries whitish. During the early stages bacteria have been isolated from this liquid. These are white in colour, very motile, 0.8 μ in width and 1 to 2 μ long, grouped in couples and more rarely united in chains consisting of as many as 12 individuals.

The optimum growth temperature lies between 25° and 27° C., exposure to direct sunlight is fatal in 95 per cent cases and exposure for a few minutes only to low temperatures kills 60 per cent. Inoculation experiments with *Bacterium lachrymans* on healthy plants gave absolutely positive results.

The organism penetrates into the leaves through the stomata and takes up its position in the cavities beneath, spreads into the surrounding tissues, giving rise to the pathological symptoms already noticed.

This disease has already been recorded in the following parts of America: in Michigan at Big Rapids, Muskegon, Grand Haven, Holland and Big Rapids; Hudsonville; in Indiana at Plymouth, Monterey, Tyner and Ellettsdale; in Wisconsin at Racine, Portage, Ripon, Princeton and Milwaukee; in New York State at Constable, Malone, North Lawrence and Long Island; in Connecticut, in the district of Columbia, in Maryland and in the Southern States. In Canada the same disease is known in the provinces of Ontario and Quebec.

Considering the results obtained in the laboratory with copper sulphate, it would seem that Bordeaux mixture properly applied is the best remedy for this disease.

468 - **A Celery Fungus (*Septoria Petroselinii* var. *Apii*) New to Yorkshire**

ROE, T. B. in *The Naturalist*, No. 708, pp. 14-15, London, 1916.

Septoria Petroselinii Desm. var. *Apii* Br. and Cav., injurious to celery, has just been recorded in the Scarborough district. This fungus is new to Yorkshire. Although previously known on the Continent and in N. America, the first authentic record of its appearance in England was in 1909, in Somerset and Devon. Since then it has caused much damage to celery both in England and Ireland.

In 1914, three quarters of a crop of 30,000 head of celery were lost through this disease alone. In 1915, though it did not make its appearance with the same severity, still the damage caused was considerable.

The disease is usually observed about the end of July or beginning of August after it has become well established.

As it has been proved that the "seed" has been known to contain fruits of the fungus, washings from which have been made by experiment to infect healthy plants, it would be advisable for growers to watch the young plants, and at the first sign of the disease to spray them with dilute Bordeaux mixture or potassium sulphide solution. As a precautionary measure, microscopical examination of samples of "seed" might be made, and if the fungus be detected thereon, washings in a fungicide might be tried, although it is possible that this would be little more than a palliative. Growers should promptly burn all diseased foliage. The practice of throwing diseased plants on to a rubbish heap is a great mistake as there is no doubt that the fungus can live through the winter and attack fresh plants the following year.

It is said that with many visitations like that of 1915, celery growing would become impracticable.

This disease should not be confounded with that caused by *Phyllactinia apii* Halsted, from which it is distinguished by the shape of the spores.

469 - ***Peronospora parasitica* and *Septoria Petroselinii* var. *Apii* Injurious to Broccoli and Celery in Latium.** - SEBASTIANELLI A. in *La Nuova Agricoltura*, Year IV, No. 74, p. 20, Rome, Feb. 1, 1916.

Peronospora parasitica is very prevalent in the market gardens of Velletri, Cori, Cisterna etc. on the leaves of broccoli. Recently, the spread of

(1) See B. Oct. 1914, No. 957.

the disease has become so serious that in some gardens but very few plants escaped damage. Celery was very severely attacked by *Septoria Petroselinifolia* var. *Aphii*.

Diseases and Pests of the Cranberry, *Oxycoccus (Vaccinium) macrocarpus*, in the United States — FRANKLIN H. J. in *Massachusetts Agricultural Experiment Station, Bulletin 100, Report of Cranberry Substation for 1914*, pp. 50-117, Cambridge, Mass., 1915.

Fungous diseases. — These studies were carried on in cooperation with the Bureau of Plant Industry of the United States Department of Agriculture.

The "ring worm" trouble (commonly so called because it was formerly supposed to be the result of the work of some insect) was given some study. It begins in a small patch at first and, the centre recovering, the affected area gradually becomes circular. These patches persist for years, the decay on the outer side of the rim dying every season, while recovery takes place on its inner side, the circle thus growing larger yearly unless stopped by a ditch or some other obstruction. One grower has obtained good results by making 2 or 3 treatments in successive years with Bordeaux mixture.

The disease known as "false-blossom" hitherto only known in Wisconsin has been recorded for the first time in Massachusetts. The disease is evidently of a very serious character and very infectious.

The disease called "Blossom-end rot" is the chief cause of decay among "Late Howe" berries in storage. Its exact place in botanical classification is not yet determined.

As regards methods of treatment of fungoid diseases experiments have been continued with Bordeaux mixture on plots manured and unmanured. Good results were kept of the crop yield obtained and its keeping qualities. The results were contradictory but, generally speaking, the treated plots gave heavier crops and smaller fruit than the control plots; spraying is therefore to be recommended except in the case of plantations which are exceptionally severely attacked.

Treatment with Bordeaux mixture (Dr SHEAR's formula) at the watering period caused a diminution in the crop yield of more than 10 per cent.

Attempts at treatment were also made by dissolving copper sulphate in the irrigation water (1 part in 50,000 parts of water). The yield was not affected.

The lack of success with the above treatments is probably due to their direct effect on the roots.

Sanding of the plantations did not appreciably increase the yield, but encouraged fungoid diseases and impaired the keeping qualities of the berries.

Insect pests (1). — The army worm (*Heliothrips unipuncta* Haworth)

(1) See also B. Dec. 1915, No. 1361.

attacked plantations of *Vaccinium* at Cape Cod, but except in a few the damage caused was not serious.

The "gipsy moth" (*Porthetria dispar*) caused considerable loss to *Vaccinium* in several localities and is becoming more of a menace each year.

The "cranberry weevil" (*Lathronomus suturalis* Lec.) which usually harms a bog by working within the blossom buds and eating out the hearts, did much damage on some bogs in Plymouth in 1913 and caused some loss in the same locality this year.

Arsenical sprays ("Bordo" lead with Paris green) applied to the flowering period did good service.

The "spanworm" (*Epelis truncalaria* var. *faxonii* Minot) did some damage in a bog at Warcham. Several of the pupae were found to have parasitised by an Ichneumon new to science (*Campoplex variabilis*). The pupae were found after the bog had been submerged for five months.

The dying of the tips which has often been noticed at intervals is apparently attacks by the larvae of the "cranberry tip worm" (*Cecidomyia tipcana* Johnson).

Both eggs and larvae were found on the tips (as many as 5 on a single tip); the larvae form their cocoons in the soil. Flowed bogs, in case they had not been resanded before the 1st of May were, as a rule, much more seriously injured than were strictly dry bogs (without winter flowage). Flowed bogs which had been resanded the previous autumn or in the spring before the 1st of May were, as a rule, much less seriously injured than those not resanded. No bog showed great tip worm injury after a period of severe frosts. The "Late Howe" variety, as a rule, showed distinctly more injury than did the "Early Black".

For the control of the "flowed bog fireworm" (*Rhopobola vaccae* Pack), in addition to the remedies already cited, the writer recommends treatment with sweetened arsenical sprays.

Nearly a dozen natural enemies of the "cranberry fruit-worm" have been identified and bred, only 3 are abundant enough to be of importance: a Braconid (*Phaenroloma tibialis* Hald), a species of Ichneumon (*Prionomeria agilis* (Cress) Ashm); a Chalcidid (*Trichogramma minus* Riley).

471 - ***Puccinia Iridis* on Cultivated *Iris*, New to Yorkshire.** - ROE, T. B. in *The Naturalist*, No. 708, p. 27, London, 1916.

Puccinia Iridis Wallr. is recorded for the first time on cultivated *Iris* in some gardens at Scarborough.

472 - **Apple Tree Mildew, *Podosphaera leucotricha* Salm., New to Yorkshire.** - ROE, T. B. in *The Naturalist*, No. 708, p. 27, London, Jan. 1916.

The above is a first record for Yorkshire of *Podosphaera leucotricha* Salm. The apples attacked were from trees at Ebbwston, near Scarborough and had suffered severely, being small in size and studded with perithecia of the fungus. The specimens found were in the ascigerm or perfect stage which is apparently rare in England, the oidium or asexual stage being that usually met with.

123. "Sooty Blotch" of the Pear (*Leptothyrium carpophilum*) in England.

SALMON E. S. and WORMEYD H. in *The Gardener's Chronicle*, Vol. CLX, No. 1518, pp. 15-16, Figs. 25-28, London, Jan. 25, 1916.

The writers have met with two instances where pears of the "Catil" variety — in one case grown in a garden at Reigate, Surrey and in another case at Wye, Kent — become severely attacked by the "Sooty Blotch". The disease is probably due to *Leptothyrium carpophilum*.

The writer describes the points of difference between this latter organism and *Lept. Pomi* which causes the "sooty blotch of the apple".

124. *Sclerotinia Linhartiana* on Quince, New to Bulgaria. МАЙМЕНОВ В. in *Извѣстия Спиритно-Болгарскѣ Земеделскѣ Професорѣ*, Year XX, Vol. 1, pp. 166-167, Sofia, 1915.

The disease of quince caused by *Sclerotinia Linhartiana* Prill, et Del. (conidial form of which is known by the name of *Monilia Linhartiana* Sacc.) has been reported for the first time in Bulgaria at Borisovgrad, Sredna (Plodvisko) Terovo, Riustendit, and Gimmurgina. In damp weather the pest spreads with great rapidity and in a few days as high as 20% of the foliage may be affected. The fungus attacks the leaf near the petiole, spreads along the mid-rib and following the lateral veins, gradually covers the entire leaf.

Irregular spots of a dirty-white colour appear on the surface of the leaf, these gradually coalesce and become covered with a whitish veil of the hyphae and conidia of *Monilia*. These conidia, through insect agency gain access to the flowers and germinate, developing a branching mycelium which eventually reaches the ovary. The processes of fertilization, swelling and formation of the fruit are thus very materially affected and when winter comes all the infected parts fall to the ground.

In the spring, the apothecae of *Sclerotinia* develop on the fallen fruit, and the ascospores which form attack in their turn the young growing leaves, thus spreading the disease over a still wider area.

The following methods of control are advised:

- 1) Cutting off all infected parts and destroying by burning;
- 2) Spraying with Bordeaux mixture before the leaves begin to bud, as a preventive measure;
- 3) Dusting the diseased plants with calcium sulphate.

125. A Honeycomb Heart Rot of Oaks Caused by *Stereum subpileatum*.

LONG WILLIAM H. in *Journal of Agricultural Research*, Vol. V, No. 16, pp. 121-128, Pl. XL, Washington, D. C., 1915.

During investigations made in 1912, 1913 and 1914 on the pathological condition of the oak (*Quercus* spp.) in the National Forests of Arkansas and other sections of the United States, the writer found a large percentage of the trees, especially in some regions of Arkansas, attacked by various species of heart rotting fungi. Among these were *Polyporus peltate*, *P. berkeleyi*, *P. frondosus* and *P. dryophilus*. In addition to the foregoing a new type of rot was found caused by *Stereum subpileatum*.

In the final stage of this rot the diseased wood resembles a piece of honeycomb, hence the name.

So far, this rot has been observed, in Arkansas, on *Quercus alba*, *Q. lyrata*, *Q. palustris*, *Q. phellos*, *Q. rubra*, *Q. texana*, *Q. velutina*; in Florida, on *Q. virginiana*, *Quercus* sp. and *Liquidambar styraciflua*; in Kentucky, on *Quercus* sp. (?); in Louisiana, on *Q. lyrata*; in Mississippi, on *Q. bicolor*; in Missouri, on *Q. palustris* (?); in Virginia, on *Q. alba*, *Q. coccinea*, *Q. prinus* and *Q. velutina*; in Mexico on *Quercus* (?).

The only practicable method of control which can be applied to the forest as a whole is to prevent, so far as possible, the infection of the trees. This can be done: 1) by eliminating all forest fires, since they produce wounds on the butts of trees through which the fungus enters; 2) by preventing the formation of the fruiting bodies (sporophores) of the fungus which produce the spores. This can be done by destroying all diseased timber which contains this rot.

INJURIOUS INSECTS AND OTHER LOWER ANIMALS.

- 476 - **The Psyllidae of the Cleveland (England).** - HARRISON, J. W. H. in *The Naturalist*, No. 707, pp. 300-301, London, 1915.

The following is a list of some of the Psyllids found on useful plants over a limited section of the Cleveland area:

Aphalara calthae Linn. on larch and spruce; *Psyllopsis fraxinicola* Först. *P. fraxini* Linn. and *Psylla pyricola* on ash; *Psylla salicicola* Först. and *P. ambigua* Först. on willow; *Psylla hartigii* Flor., on birch; *P. pineti* Flor. on conifers; *P. melanoneura* Först. on oaks and conifers; *P. costalis* Flor. on blackthorn, hawthorn, mountain ash, oak, etc.; *P. peregrina* Först. on hawthorn; *P. mali* Schm., on crab apple; *P. alni* Linn. at *P. forsteri* Flor. on alder; *Trioxa urticae* Linn. on elm, blackthorn etc.; *T. albiventris* Först. on willow and silver fir.

- 477 - **The Asparagus Beetle Egg Parasite.** - ROSS, W. A. in *The Agricultural Gazette of Canada*, Vol. 2, No. 11, pp. 1055-1056, 1 Fig., Ottawa, 1915.

Early in the month of June, 1915, large numbers of a minute, dark blue-green, four-winged chalcid fly were found destroying the eggs of the Asparagus beetle, *Crioceris asparagi* L., at Vineland Station, Ontario.

The female, by means of a sharp ovipositor, pierces the egg of the Asparagus beetle and deposits within it her own eggs (three to nine in number). In due course the beetle egg, its viability unaffected, hatches and the grub grows to maturity.

The larvae of *Crioceris* resist for some time, and reach the pupal stage but they are then killed. The adult chalcid is a voracious feeder on the eggs, accounting for as many as 90 per cent. At the Vineland Station Experimental Farm the work of the egg parasite was so effective that it was found possible to dispense with the customary spraying of the asparagus plants.

- 478 - **Appearance of Swarms of *Contarinia tritici* in South Russia during 1914.** - BORODINE D. N. in *Khizmatstvo*, No. 13-14, pp. 1022-1029, Kiev, 1915.

Russian entomology makes but rare mention of *Contarinia tritici* Kirby. Amongst the few who have treated the subject is quoted N. M. K.

— who wrote, in 1913, that in Russia not much harm was done to wheat by this member of the Diptera. Two years later, however, the pest appeared in swarms in the two South Russian provinces of Poltava and Kherson, especially in the former. Observations made by the writer himself and communications received from correspondents of the Entomological Department of the provincial Zemstvo of Poltava have shown that the adult insects made their appearance between May 9 and 20 (old style). The writer, however, believes that period to have been a good deal longer.

Oviposition took place over the whole of the time and about June 12 large numbers of the larvae were hatched and continued to appear up till harvest time. Their number then greatly diminished, especially after rain. The descent of the larvae to the soil to pupate occurred towards the 20, when rain began to fall and the number of larvae on the ears rapidly diminished; finally they quite disappeared. After the disappearance of the larvae from the wheat harvested in the fields of the Experimental Agricultural Station of Poltava, a careful search was made for them in the soil beneath the sheaves, but with no result. A number of larvae of *G. striatella* were put into small glass tubes during the months of June and July 1914. Although the conditions were most unfavourable owing to the sand of the boxes in which the tubes were placed not having been changed since the spring of 1913, and watering only being carried out in the middle of May, between June 2 and 8 a number of parasites were bred from the larvae and identified by N. W. Kormosomov as *Gonioeris albipennis* Nees (8 specimens), *G. clavicornis* Thomas (3 specimens), *Microgaster* sp. (1 specimen).

In order to ascertain the amount of damage caused by *Cont. tritici* a number of larvae and cocoons on each ear were counted, and also the number of injured grains. The percentage of the injured grains was calculated on the total number of grains contained in a 100 ears of corn. Usually the proportion of ears attacked was 80-90 per cent. The proportion of damaged grains 10-66 per cent.

In the following table are given the results of 7 examinations:

Species attacked	Date of sowing	Date of examination	Number of ears	Total number of grains	Number of injured grains	Percentage
Spring wheat	—	June 11-13	100	2 106	212	10.016
	August 5	" 27	100	2 736	267	9.75
"	" 13	" 27	100	2 298	144	6.26
"	" 25	" 28	100	2 354	26	1.09
"	September 5	" 30	100	2 621	19	0.72
Spring rye	—	" 16	100	3 890	175	4.49
Spring wheat	—	" 20	93	1 386	212	15.2

The amount of damage caused is correlated with the time of sowing for, as may be seen by examinations 2, 3, 4, and 6, the early sowings are most severely attacked, a fact which is probably connected with the sowing period of *Contarinia*. Comparing the damage caused to wheat by other insects the most serious is that caused by *Contarinia*, and the opinion of entomologists is drawn to the fact that the insect in question caused in North America damages assessed at some millions of dollars.

- 179 **The Influence of Rainfall and the Non Burning of Trash on the Abundance of *Diatraea saccharalis*, Injurious to the Sugar Cane** (1). - WOLCOTT (1915), in *Govt. of Porto Rico, Board of Commissioners of Agriculture, Insular Experiment Station, Rio Piedras, P. R., Circular No. 7*, pp. 1-6, 1 diagram. San Juan, Porto Rico, 1915.

The most important insect injurious to sugar cane in the West Hemisphere is the smaller stalk-borer, *Diatraea saccharalis* Fabr. which occurs in abundance in the southern United States, Mexico, Cuba, Jamaica, Santo Domingo, Porto Rico, St Kitts, Barbados, Trinidad, Demerara and Argentina, besides other islands and countries of lesser importance in sugar production.

The extent of the damage caused by this insect varies in different localities and between very wide limits. As a result of numerous voyages and researches, the writer has been able to fix the following points:

- 1) There is an inverse relationship between the total annual rainfall and the abundance of *Diatraea*.
- 2) The burning of trash on the field after the cane is harvested kills large numbers of *Trichogramma minidum* Riley, the most effective enemy of *Diatraea*, and consequently favours the development of this larva. This is found to be true for all localities and the burning of trash is therefore to be discouraged.

It is particularly important to draw the attention of planters to this fact, as one of the most common methods used for the control of insect pests is precisely that of burning the trash on the fields.

Diatraea is not abundant in Jamaica, but there is a noticeable difference between the north and south sides. On the south side, *Diatraea* infests 15 to 30 per cent of the stalks. The difference is due to the amount of rainfall, the total precipitation being much higher in the north where the insects are scarcer.

In Barbados the scarcity of rain favours the development of the pest and the presence of *Trichogramma* act as a sufficient check.

In Cuba, in the sugarcane districts of Havana, Matanzas and San Clara, where the annual rainfall averages from over 50 inches to over 90 inches, *Diatraea* attacks about 10 per cent of the canes. In Camaguey and Oriente provinces where the annual rainfall is from 30 to 50 inches the infestation by the borer is 40 per cent.

(1) See also B. Oct. 1915, No. 1206.

The following table gives data relating to Porto-Rico :

Locality	Inches of Rainfall 1914	Percentage of infestation 1914-15		
		Average of all fields	Fields where trash was burned	Fields where trash was not burned
Casco	101	0 (8)	0	0 (8)
Glaser	95	5 (6)	0	8 (6)
Agüa	*70	11 (13)	13 (6)	9 (6)
Manatí Motovis	72	0 (6)	10 (3)	1 (6)
Camaguey	70	11 (9)	0	11 (4)
San Rafael	70	15 (8)	10 (4)	10 (4)
San Diegues	66	17 (7)	0	17 (4)
San Rafael	66	30 (9)	41 (5)	26 (4)
Castro	58	6 (5)	0	6 (5)
Polanco	58	37 (5)	60 (2)	22 (3)
Arriba	55	26 (16)	60 (1)	24 (18)
Jama Díaz	60	32 (9)	34 (8)	18 (1)
Mayaguez-José	45	17 (4)	4 (4)	0
Aguirre	34	15 (7)	50 (5)	31 (2)
Patula	27	37 (9)	41 (9)	24 (3)
San Juan	25	48 (8)	18 (8)	0
Destino Salinas	23	94 (5)	77 (3)	11 (2)
Mayagüilla	24	76 (5)	76 (1)	0
Santa Isabel	22	12 (4)	78 (3)	16 (1)
San Juan	21	66 (28)	68 (14)	31 (1)

* Average of rainfall of *hacienda*, not of the town. Figures in brackets after per centages indicate numbers of fields examined.

The eggs of *Diatraea* are deposited on the leaves of the cane, and when the young larvae hatch a considerable interval elapses while they crawl about on the cane before they enter the stalk, or midrib of the leaf. A heavy fall of rain during this period would wash them on to the ground, where they would fall an easy prey to natural enemies, especially *Solenopsis geminata* ("hormiga brava").

191. *Phlyctaenodes sticticalis*, Microlepidopteron. Injurious to Tobacco in Roumania (1).—KNECHTEL WILHELM R., in *Parasitica Generalia et Rerum Menophrasica Studia*, Budapest, Year III, Part II, IV, pp. 24-26, Figs. 1-2, Bucharest, 1914.

During 1915, *Phlyctaenodes sticticalis* has been found attacking tobacco in the east of Rumania. It had been previously recorded (1900) and after as injurious to field crops, particularly tobacco.

(1) See *R. Jan.* 1915 No. 124.

The larvae have been reported from various parts of Eastern Rumania and of Northern Dobruia, especially from the province of Ialova, Falcui, where they appeared on July 4 in the commune of Creasta; in this latter place fifteen plantations were attacked, two being completely destroyed. They were also observed in the provinces of Pripoteni, Tulcea (communes of Ghidigheni and Carlomanesti), Solesti Vaslui, Lipova Vaslui (communes of Lipovat, Deleni, Munteni, Nanjesti) Macin, Tulcea and Badadag Tulcea. They are commonly known as "Omida Rumanilor".

The tobacco-leaves are attacked at the margins and gradually die until only the skeleton remains. Damp and rainy weather favours the development and spread of the insect, whose attacks coincide with the rainy seasons. Among the natural enemies of *Ph. sticticalis* is a fly, *Mikroklossia prima*, already recorded by KRASSILTSCHIK. As a means of control, the direct destruction of the larvae and the isolation of insect centres are recommended; also spraying with insecticides, disinfecting of the soil, and burning of all vegetable refuse and of any other injurious matter.

481. **The Pavement Ant (*Tetramorium cespitum*) as a Pest of Coldframe and Greenhouse Crops in Virginia** (1). — SMITH LOREN B. in *Virginia Truck and Fruit Station, Bulletin*, 19, pp. 353-365, Figs. 75-83, Norfolk, Virginia, 1915.

During the past two years, horticulturists in the Norfolk region have been suffering losses from the attacks of the pavement ant. This insect is a native of Europe and was introduced into America probably 150 or 200 years ago. Since that time it has become quite widely distributed throughout the Eastern United States; it is only recently, however, that it has been reported as injurious to vegetable crops.

Two species occur in the above region which might be confused with the pavement ant: the red ant (*Monomorium pharaonis* L.) and the black ant (*Monomorium minutum* Mayr.). These can be distinguished by their smaller size and difference in colouration.

T. cespitum has been observed to feed on the following vegetables: kohlrabi, cauliflower, cabbage, eggplant, Brussel sprouts, pepper, turnip, radish, parsley and lettuce. The attacks occur on the roots, crown and lower portion of the stem and have been found to be more severe during the spring, autumn and winter seasons.

Where the nests are accessible, fumigation with carbon bisulphide has proved the more efficient method of control. If the nest occurs on the surface of the ground, place a saucer containing a few ounces of the liquid fumigant on the ground over the nest and cover the whole with several thicknesses of heavy canvas. Allow the fumigation to continue for at least 24 hours. If the nest is underground, push swabs of absorbent cotton soaked in the fumigant down into the nest, firmly packing the soil over them.

In case these methods cannot be applied, poison baits may be used (Paris green and bran, or potassium arsenate mixed with orange pulp).

(1) See also *B.*, Jan., 1916 No. 134.

ing the ants with hot water is also an advantageous method and fish scrap fertiliser may be found to have some value as a repellent.

182 - **Staphylinid Injurious to Turnips in France.** - VINCENT in *Comptes rendus des séances de l'Académie d'Agriculture de France*, Vol. II, No. 1, pp. 87-88, Paris, January 20, 1916.

In the localities of the Department of Finistère where turnips are closely cultivated, circular zones may often be observed where the crop is thin and irregular. Some of the plants wither and quickly die off, others are dwarfed and weedy. The leaves and tap root do not show any traces of fungoid disease, but on examining the surrounding soil numerous larvae will be seen which attack and devour the roots.

The larvae are from 3 to 4 mm. long; body creamy white, head black. The black adults bred from the larvae in the laboratory were identified as belonging to the family of the Staphylinidae. This insect is very sensitive to insecticides. Good results were obtained with toluene and still better ones with benzene in the proportion of 8.8 gallons per acre.

However, it would probably be more economical to give up the crop or at any rate to adopt a rotation.

183 - ***Tinea cloacella*, Injurious to Dried Edible Mushrooms.** - KRAUSE-ANTON in *Zeitschrift für Forst- und Jagdwesen*, Year 48, No. 2, pp. 73-78, Berlin, February 1916.

On March 22, 1915, the writer received from Eberswalde (Germany) a quantity of dried mushrooms which had been attacked by larvae of different ages.

The first adult insect emerged on April 9, and was identified as *Tinea cloacella*. Most of the adults, however, did not appear till May.

The first mating was observed on May 16. During the mating period, the phototropism of the insects was more strongly positive than usual.

The eggs were always deposited singly on the mushrooms. The writer confined a number of males and females in a cage, together with small bits of mushroom; eight days after, in addition to the eggs, there were a number of young larvae about 1 mm. in length.

It is interesting to note that the insect requires very little water for its development and that many larvae die before pupating, in the same way many others do not survive the pupal stage.

The completely developed larvae are 9 mm. long; the pupae about 5 mm. The bodies of the former are covered with excrescences which resemble closely the hairs characteristic of Lepidopterous larvae. This is a point which should prove interesting from the systematic point of view.

As dried mushrooms become worthless when attacked by *Tinea cloacella*, it is advisable to examine them from time to time, removing all those attacked by the Lepidopteron.

184 - **The "Fruit-fly" (*Ceratritis capitata*) Injurious to Citrus in Greece (1).** - PAPAGEORGIOU P. in *Deltion Vasilikiis Georgikis Heterias*, Year VII, No. 12, pp. 258-260, Fig. 1, Athens, 1916.

Ceratritis capitata caused considerable damage in 1915 among Citrus trees in Attica and Epirus. The fruit of lemons, oranges and mandarins

(1) See B. Sept. 1915 No. 993.

(Ed.).

attacked by this insect are unsaleable and often drop to the ground at the slightest breath of wind.

The following means of control are advised :

- 1) All tainted fruit to be collected and treated with lime, as this kills the larvae and prevents the development of subsequent generations.
- 2) Tin cans containing sweetened poisonous substances to be hung round the plantations to every 20 th. tree; good results were obtained by a 1 per cent solution of arsenate of soda added to grape syrup; the Diptera which come round the cans and, absorbing the liquid, are killed in great numbers.

485. **The Bagworm (*Thyridopteryx ephemerae-formis*), an Injurious Shade-Tree Insect.**—HOWARD J. O. and CHITTENDEN F. H. in *United States Department of Agriculture, Farmer's Bulletin*, No. 701, pp. 1-11, Figs. 1-11. Washington, Jan. 15, 1916.

Thyridopteryx ephemerae formis (" Bagworm " or " Basketworm ") has recently caused considerable damage in the States of New Jersey, Pennsylvania, Maryland, Virginia, West Virginia, Ohio, Indiana and Illinois.

The larvae of this lepidopteron construct themselves a sort of bag, with the aid of fragments of leaves cut from trees and held together by means of silk. The anterior portion of the body of the larva remains inside and the animal crawls about on the branches and devours the leaves of a large number of plants. Practically all shade trees are attacked and in some years the larvae are found on nearly every species of orchard and forest tree also. They also occur on willows, maples, poplars and mulberry and less frequently on elms and oaks. They even feed to a certain extent on many low-growing semiwoody plants, such as elder, mallow and ragwort.

Among the natural enemies of this insect are : (*Pimpla*) *Hoplitis conquisitor* Say ; (*Pimpla*) *T. conquisitor* Say ; (*Hemiteles*) *Allocta thyridopterigis* Riley ; *Spilochalcis moriae* Riley ; *Chalcis ovata* Say ; *Dibrachys cetheanus* Ratz and *Habrocytus thyridopterigis* Ashm.

The following methods of treatment are advised :

- 1) Where possible, collect the larvae and destroy them directly.
- 2) Encourage the development and reproduction of the natural enemies.
- 3) Spray with arsenicals.

INJURIOUS VERTEBRATES.

486. **Comparative Experiments in Austria on the Control of Field Voles**—(1915-1916). MAK FRANZ in *Wiener Landwirtschaftliche Zeitung*, Year 66, No. 8, pp. 26-27, Vienna, Jan. 15, 1916.

An account of experiments carried out at the initiative of the Czech section of the " Landes-Kulturrat " of Bohemia, from March to May 1915 on the control of field voles making use of various methods. The 1916 spring weather which was favourable to the reproduction of these rodents

(1) See *B.* Jan. 1915 No. 132; and *B.* Feb. 1916 No. 264.

was also suitable for conducting the experiments. The plots of ground chosen for the purpose of the experiment were sown with clover except in a few cases where rye was used. Ditches, banks, etc. were also included.

The average number of holes counted in the fields was 5 per square meter and varied from 1 to 10. The fields were invaded to such an extent that all the plants around the holes had been destroyed for a distance of 15 cm. Three or four days before the experiment, the holes were all closed by stamping in the earth. Only those holes which the voles re-opened were used for the experiment.

The results were as follows :

1) PILLS CONTAINING 20 % OF BARIUM CARBONATE. — Five pills each weighing 0.5 gms. were placed in a hole, or between two tiles placed in the open field. During March, 40 holes and 8 pairs of tiles were treated. The pills placed in the holes gave positive results in 70 % of the cases. The pills placed in the open, between the tiles, gave negative results.

2) PHOSPHORUS PILLS. — Four pills weighing 1-1.5 gms. each were placed in each hole. The experiments were carried out during March on 44 holes with two types of pills. The first type gave positive results in 25 per cent of the cases, and the second type positive results in 28 per cent. The same experiments repeated in May gave negative results throughout.

3) PHOSPHORUS PASTE. — Straw was smeared with the paste and placed in the holes. When the voles left their holes some of the paste adhered to their bodies, the rodents then licked themselves and were poisoned. Thirty holes were treated in this way and left open during the whole period of experiment. The voles were usually poisoned after 3 days. The experiments conducted both in March and May gave positive results in 72 cases per cent.

4) ARSENICAL PASTE. — This mixture was composed of arsenious acid, caustic soda, potato meal, water and molasses.

It was employed in the same manner as in the preceding experiments. Thirty holes were treated and both in March and May, 50 cases per cent gave positive results.

5) GRAINS OF WHEAT POISONED WITH STRYCHNINE. — The grains were soaked for 45 hours in a strychnine solution containing 4 gms. of poison (nitrate) per kg. of wheat.

The grain was then sweetened with saccharose or saccharine ; 1 gm. of calcium bicarbonate was then added to the mixture with some fuchsin to restore the grains to their normal colour. The grains were then put into the holes.

Forty holes were thus treated. The experiments made in March gave positive results in 87 cases per cent ; those carried out in May gave similar results only in 7 cases per cent.

6) OAT GRAINS POISONED WITH STRYCHNINE. — The husks were first removed from the grains and these latter then treated like the wheat. The experiment was made on 40 holes. In March, good results were obtained in 92 cases per cent ; in May, only in 7 cases per cent.

7) MORPHINE PILLS. — Five pills were placed in each hole which

was then closed. Part of the pills were put out when the weather was dry and part when it was wet. In the first case good results were obtained, in the second they were negative.

8) POISONED BISCUITS. — The poisoned biscuits placed in the holes were not eaten.

9) CARBON DISULPHIDE. — This was injected into the holes by means of a special apparatus. The result was satisfactory whenever the hole was well filled by the gas. Carbon disulphide is, however, difficult to employ.

10) SULPHUR DIOXIDE. — This was introduced into the holes by means of special cartridges invented by the writer.

Finally, experiments were made with traps.

Conclusions. — 1) The results obtained by the different methods depend upon a number of factors, such as : the season in which the campaign is conducted, the nature of the soil ; the number of voles in the field, etc. ;

2) During the winter and in early spring, when food is scarce, the best method is that with poisoned grain and particularly the oat-grain treated with strychnine ;

3) Pastes also gave good results, especially the arsenical paste, which has the advantage of being adapted for use in all seasons ;

4) Of the pills, those containing morphine gave the best results.

5) In April and October when the soil is well stocked with food, the employment of gases is advisable.

6) For destroying voles in ditches or banks, etc. the best medium is sulphur dioxide.

487 - **Plague of Field-Voles in the Province of Kieff during 1914.** — CHARLEMANN, in *Khoshaistwo* (The Farm), No. 45-46, pp. 1058-1059. Kiev, 1915.

In 1914, many provinces of South Russia were very seriously invaded by field voles, while in the spring of the following year the number of the rodents was greatly diminished ; in fact, in some places they had entirely disappeared. In the autumn, when it was possible to form a judgment, from the number of holes, of the extent of the attack, it was so that this number was not above the normal. The cause of the rapid disappearance of the animals is attributed to weather conditions. The spring of 1915 was a very changeable one. Up till February, the weather was very mild and the snow melted almost everywhere ; in the latter half of the month, however, the cold returned, snow fell once more and the water froze in the fields. This sudden return of winter must have had effects on the voles.

After the spring in question, *Microtus arvalis* Pall. disappeared almost completely from the province of Kieff ; *Eutamias glareolus* Schreb. was seen very rarely, and the number of *Arvicola amphibius* L. markedly diminished. The number of other species of rodents also decreased.

In connection with this decrease, the opinion is quoted of K. A. SAENINE who, when speaking of the distributional centres of voles, says that the problem of the control of voles is confined to the discovery and destruction of such centres during the years in which their numbers are observed to be less.

According to some writers, the vole plagues occur approximately every ten years. If this is admitted, the above advice may well be borne in mind.